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13. ABSTRACT *(Maximum 200 words)*

The objectives of this study are to investigate flood damages along Upper Penitencia Creek in Santa Clara County, California; to identify potential alternatives for alleviating these damages while minimizing adverse impacts on fishery and wildlife resources; and to determine whether there is a Federal interest to proceed into the Feasibility Study Phase. The study area includes approximately three square miles of the Upper Penitencia Creek watershed which lies midway between the cities of San Jose and Milpitas. The study alternatives evaluated to alleviate flood damages include: 1) a modified floodplain with a channel bypass plan; 2) a modified floodplain with a partial bypass plan; 3) a modified floodplain with a partial bypass and a trapezoidal channel plan; and 4) a no action plan. For each of the structural alternatives three floodproofing variations were considered for 14 homes in the upstream portion of the study area. The conclusions of this Reconnaissance study indicate that Alternatives 1 and 2 can reduce flood damages along Upper Penitencia Creek. These plans are economically feasible, meet the requirements of the System of Accounts and have the support of the Santa Clara Water Valley District. Therefore, Federal participation in the next study phase, the Feasibility Study is Recommended.

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UPPER PENITENCIA CREEK
FLOOD CONTROL STUDY
SANTA CLARA COUNTY, CALIFORNIA
RECONNAISSANCE REPORT

U.S. Army Corps of Engineers
San Francisco District
211 Main Street
San Francisco, California 94105-1905

July 1995

SYLLABUS

The objectives of this study are to investigate flood damages along Upper Penitencia Creek in Santa Clara County, California; to identify potential alternatives for alleviating these damages while minimizing adverse impacts on fishery and wildlife resources; and to determine whether there is a Federal interest to proceed into the Feasibility Study Phase.

The study area includes approximately three square miles of the Upper Penitencia Creek watershed, which lies midway between the cities of San Jose and Milpitas. Upper Penitencia Creek flows through this urban portion of the watershed before emptying into Coyote Creek, which eventually empties into the San Francisco Bay. This portion of the watershed has a history of agricultural use, but urban development has replaced agricultural land use over the past two decades, and few parcels of undeveloped land remain. Over 4,000 residential and commercial buildings lie within the 100-year floodplain. Approximately 1,500 of these buildings would experience damages from flood waters entering their first floors during a 100-year flood event.

Flood damage is the primary problem that has been identified within the study area. The study alternatives evaluated to alleviate flood damages include: 1) a modified floodplain with a channel bypass plan; 2) a modified floodplain with a partial bypass plan; 3) a modified floodplain with a partial bypass and a trapezoidal channel plan; and 4) a no-action plan. For each of the structural alternatives, three floodproofing variations were considered for 14 homes in the upstream portion of the study area.

Alternatives 1 and 2 would provide protection from the 100-year flood event while also satisfying the System of Accounts. Although Alternative 3 would also provide 100-year level of protection, major adverse environmental impacts prevent it from satisfying the Environmental Quality Account.

The conclusions of this Reconnaissance study indicate that Alternatives 1 and 2 can reduce flood damages along Upper Penitencia Creek. These plans are economically feasible, meet the requirements of the System of Accounts, and have the support of the Santa Clara Water Valley District. Therefore, Federal participation in the next study phase, the Feasibility Study, is recommended.

UPPER PENITENCIA CREEK
FLOOD CONTROL STUDY
SANTA CLARA COUNTY, CALIFORNIA
RECONNAISSANCE REPORT
JULY 1995

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UPPER PENITENCIA CREEK
FLOOD CONTROL STUDY
SANTA CLARA COUNTY, CALIFORNIA
RECONNAISSANCE REPORT

I INTRODUCTION

1. STUDY AUTHORITY

This report was prepared under the authority of the Flood Control Act of 18 August 1941 which authorized a preliminary examination and survey of the Coyote River (now known as Coyote Creek), its tributaries, and adjacent streams. Section 4 of this Act states:

"The Secretary of War is hereby authorized and directed to cause preliminary examinations and surveys for flood control, to be made under the direction of the Chief of Engineers, in drainage areas, the United States and its territorial possessions, which include the following named localities: Coyote River and tributaries, California; San Francisquito Creek, San Mateo and Santa Clara Counties, California; Matadero Creek, Santa Clara County, California; and, Guadalupe River and tributaries, California."

This study of Upper Penitencia Creek is authorized by Section 4 since Upper Penitencia Creek is a tributary of Coyote Creek.

2. PURPOSE AND SCOPE

The purpose of this Reconnaissance Report is to investigate the feasibility of providing Federal assistance for flood protection for the residential, commercial, and industrial properties which are repeatedly impacted by flood events along Upper Penitencia Creek in Santa Clara County, California. This report analyzes the potential flood threat and develops several alternatives to prevent and/or alleviate the damages associated with a flood event within the study area. The study alternatives include structural plans and a no-action plan. The report analyzes the costs, benefits, and environmental impacts of each alternative.

3. PRIOR STUDIES AND REPORTS

There have been no reports concerning Upper Penitencia Creek produced by the Corps of Engineers prior to this study. However, at the request of the Santa Clara Valley Water District (SCVWD), the Soil Conservation Service (SCS), now known as the Natural Resources Conservation Service (NRCS), prepared a report entitled "Upper Penitencia Creek Watershed Project", dated August 1990. That report presents five alternative plans to address flood

threats to the study area. All five plans provided protection for the 100-year flood event. The recommended plan combined levees, floodwalls, bypass structures, and floodproofing along 3.6 miles of streambank. This plan had a benefit-to-cost ratio of 1.2 and a first cost of $14,657,000. These figures did not include real estate costs. The NRCS was unable to implement this plan since it did not meet NRCS's requirement to provide at least 20 percent of the benefits to agricultural or rural areas.

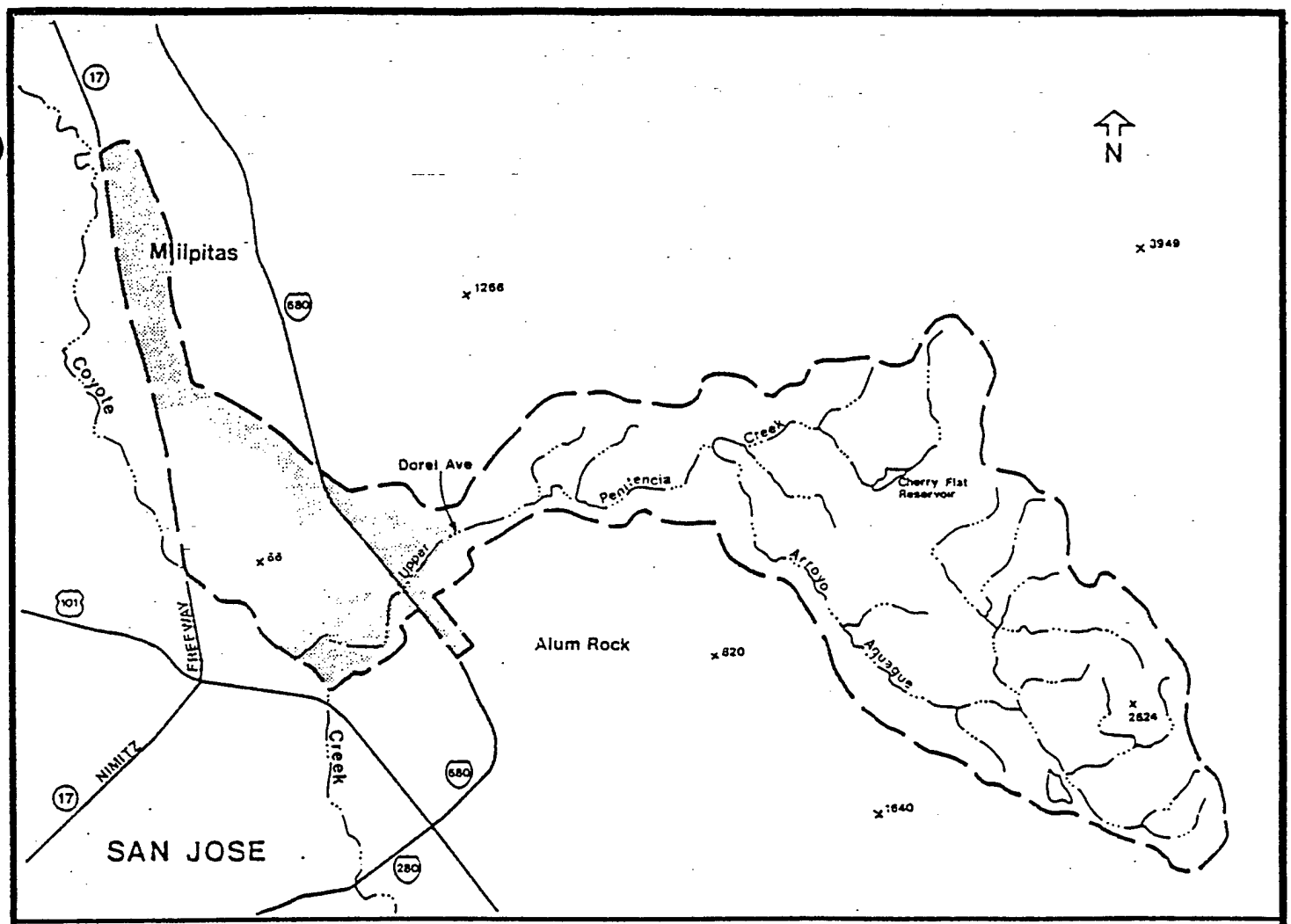
4. STUDY AREA AND BASIN DESCRIPTION

A. Basin. Upper Penitencia Creek drains approximately 24 square miles (15,300 acres) in the eastern portion of the Santa Clara Valley and in adjacent portions of the Diablo Range. The Creek empties into Coyote Creek, which drains the entire eastern side of the Santa Clara Valley and empties into the San Francisco Bay east of Alviso. The watershed lies in and adjacent to the eastern part of the City of San Jose and extends northward into the City of Milpitas. A location map is shown in Figure 1.

B. Topography. The topography of the upstream (eastern) portion of the watershed is mountainous, with sharp relief and many steep slopes. The downstream (western) portion of the watershed consists of an alluvial apron that gently slopes from the foothills of the Diablo Range down to the center of the Santa Clara Valley. Elevations within the watershed range from 3,000 feet above sea level in the upper watershed, to 280 feet at Dorel Drive near the base of the mountains, to 80 feet at the junction of Upper Penitencia Creek and Coyote Creek, and to about 10 feet at the extreme northern end of the watershed.

C. Land Use. Approximately 21 square miles of the watershed are relatively undeveloped. The steep topography of the upper (eastern) portion of the watershed has prevented development. However, the gentle slopes of the lower (western) watershed have made this region suitable for agricultural purposes, particularly for orchards, truck crops, and cut flowers. Over the last 15 to 20 years, urban development has replaced agricultural land use in this 3 square mile area, and few parcels of undeveloped land remain. Over 4,000 buildings lie within the 100-year floodplain. Over 1,500 of these would have water entering the first floor in a 100-year flood event.

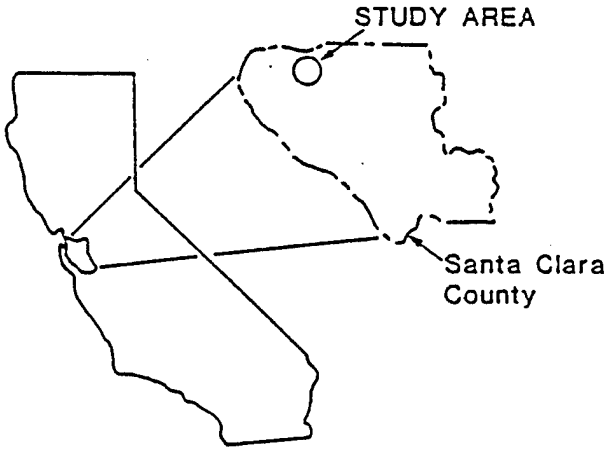
D. Floodway Designation. Local authorities have informally designated a 100-year floodway along the banks of Upper Penitencia Creek for nearly 20 years. In 1977 Santa Clara County prepared the Penitencia Creek Master Plan, which was developed in cooperation with the Santa Clara Valley Water District (SCVWD) (the non-Federal sponsor), the City of San Jose Parks and Recreation Department, and other organizations. This plan states "Where development has occurred along the Creek, a floodplain has been designated by the Santa Clara Valley Water District in



Approximate Scale 1:100,000

Figure 1

LOCATION MAP



LEGEND

- Watershed Boundary
- Roads
- Creeks
- Railroad Tracks
- × 386 Spot Elevations
- Floodplain (Approximate)

anticipation of the 100 year flood, but to date is not implemented." This floodplain is an integral component of the master plan and is incorporated into the recreational trail plan and grading of the park. The recommendations of the plan state that the "natural processes of the Creek system" can be utilized to provide flood control and recreation opportunities.

In 1981 the *Agreement for the Joint Use of Lands of the Upper Penitencia Creek Park Chain By and Among Santa Clara Valley Water District, County of Santa Clara and City of San Jose* was executed. This tri-lateral agreement endorses the Master Plan and directs the SCVWD to obtain fee title to privately-owned lands in the designated floodway. Although the ordinance which officially designates this floodway has not yet been passed, the non-Federal sponsor's letter of intent states that the Board of Directors of the SCVWD is expected to pass the ordinance prior to signing a Feasibility Cost Sharing Agreement (FCSA) with the Corps of Engineers.

E. Water Management Practices. Upper Penitencia Creek is normally dry or nearly dry during the summer months. The City of San Jose operates Cherry Flat Reservoir, a 500 acre-foot reservoir located 5 miles upstream of Dorel Drive. This reservoir supplies water to Alum Rock Park. Upper Penitencia Creek's principal tributary, Arroyo Aguague, joins Upper Penitencia Creek midway between Cherry Flat Reservoir and Noble Avenue, which is near the upstream end of the area under consideration for flood protection.

SCVWD operates a number of percolation ponds which recharge the local ground water. Water is diverted into these ponds from Upper Penitencia Creek near Noble Avenue. Excess water spills back into the creek. Some of this flow infiltrates the streambed, while some of it continues downstream to Mabury Road, where it is once again diverted into a percolation pond. Thus, during dry periods, this water augments the natural flow in the creek between Noble Avenue and King Road, but the creek remains dry between King Road and Coyote Creek.

The Cherry Flat Reservoir and SCVWD percolation ponds are operated separately. Neither system releases water for fish and wildlife habitat purposes.

5. PLANNING PROCESS

The planning process consists of the six following steps: (1) identification of water and related land resources problems and potential opportunities, (2) inventory, forecast , and analysis of water and related land resource conditions within the study area, (3) formulation of alternative plans to address the problems identified in step 1, (4) evaluation of the effects of the alternatives plans developed in step 3, (5) comparison of

alternative plans, and (6) selection of the recommended plan based upon the results of the comparison in step 5. These six steps are repeated as new information becomes available throughout the planning process.

Throughout the study, an emphasis was placed upon identifying the problems and opportunities, defining the planning objective, and development of the alternative plans. Coordination with other agencies was performed to ensure that problems, concerns, and opportunities that could be addressed through water and related land resources planning received the broadest attention possible.

The second, and final, phase of the planning process, the Feasibility Study phase, would be used to further evaluate the alternative plans developed during the Reconnaissance Study phase. The Feasibility phase explores alternatives in greater detail so that a final plan may be selected and recommendations for Federal participation in project implementation can be made.

6. REPORT ORGANIZATION

This report is divided into seven chapters as described below:

I. INTRODUCTION. This chapter presents an overview of the study purpose and scope, prior reports, the study area, the planning process, and report organization.

II. NEED FOR AND OBJECTIVES FOR ACTION. This chapter presents the planning objectives that were formulated as guides for the development of the alternative plans. Public concerns are presented in this chapter, as well as the problems and opportunities and planning constraints associated with the study area.

III. PLAN FORMULATION. This chapter includes the plan formulation rationale used during the development of the alternative plans. The alternative plans developed to address the planning objectives are presented, and a comparison of plans is made, based on benefits, costs, and implementation considerations. This chapter also identifies the plans which are carried forward into the Feasibility phase for further evaluation.

IV. TECHNICAL CONSIDERATIONS. This chapter presents the design and the economic and environmental considerations for each alternative plan.

V. PUBLIC INVOLVEMENT. This chapter discusses the public involvement process that occurred during this study.

VI. PLAN FOR FEASIBILITY STUDY. The future cost-sharing requirements needed to conduct the Feasibility Study phase are presented in this chapter. The Feasibility Study phase schedule and draft cost-sharing agreement are also presented in this chapter.

VII. RECOMMENDATIONS. This chapter presents the conclusions of this study and the recommendations for further study.

II NEED FOR AND OBJECTIVES FOR ACTION

1. GENERAL

This chapter presents the results of the first and second steps of the planning process, identification of water and related land resources problems and opportunities, and forecasting and analysis of water and related land resource conditions in the study area. Descriptions of the national planning objective, public concerns, and planning constraints are also offered in this chapter.

2. NATIONAL OBJECTIVE

The objective of Federal projects is to formulate solutions which alleviate problems and take advantage of opportunities in ways that contribute to the National Economic Development (NED). Contributions to the NED are defined as increases in the value of the national output of goods and services. The NED objective must be accomplished without unreasonable adverse environmental quality (EQ) impacts.

3. PUBLIC CONCERNS

The public review process for the 1990 NRCS draft plan-EIS revealed various public concerns regarding the flood control projects proposed by that study. These issues are summarized below.

- Potential impacts on fish resulting from effects on streambed sedimentation, water quality, and migration pathways.
- Protection of water quality for the objectives of recreation, and aquatic and terrestrial habitat.
- Loss of riparian habitat.
- Aesthetic impacts on park areas from floodwalls and the bypass channel.
- Impacts on park trail access.
- Removal of the north end of Viceroy Way.

4. PROBLEMS AND OPPORTUNITIES

Flood damage has been identified as the single problem to be addressed by this study. Little information is known about the flooding along Upper Penitencia Creek prior to 1950. At that time, the economy was devoted to agriculture, and flooding was felt to be beneficial to the production of agricultural crops.

Perhaps the largest flood of this century occurred on March 7, 1911. A local newspaper reported that water stood three feet at Capitol Avenue and that two railroad bridges in the canyon were carried away.

The largest recorded flood on Upper Penitencia Creek occurred in 1958 and had a peak flow of 2,100 cubic feet per second (cfs), which is roughly equivalent to a 13-year event. More recently, floods have taken place in February 19, 1980 (1,700 cfs) and March 31, 1982 (1,970 cfs). These floods did not cause any loss of life, but caused considerable damage to residential and commercial property along the creek channel. Damage estimates for the 1982 flood, which was estimated to be a ten-year event, were between $1 and $2 million. The most recent flood occurred in January 1995; estimated peak flows were 1,100 cfs (approximately a 4-year event). Damage data is not yet available for this event, but maps of the area flooded during the January 1995 storm have been prepared (see Appendix C).

The Economic Analysis of the Upper Penitencia Creek study area (Appendix A) calculates the expected economic losses associated with a 100-year flood event. Damages to buildings and contents resulting from an event of this magnitude are estimated to exceed $120,000,000. The zero damage point is approximately the 5-year event.

5. PLANNING CONSTRAINTS

Planning constraints are defined as overriding concerns that must be considered in the formulation of a plan. The following planning constraints were identified for this study.

A. Fishery Resources. Upper Penitencia Creek has surprisingly good aquatic habitat considering its urban location. The combination of perennial flows in the upper portion of the creek, a relatively unmodified streamcourse, and generally good aquatic shade along most of the creek's length result in the creek retaining a reproducing population of steelhead trout, a rarity in the South Bay. Although the creek supports a reproducing population of steelhead trout, the current practice of water diversions disrupts their migratory patterns. Any additional disturbance to these patterns may jeopardize the remaining population. Therefore, any flood protection project must avoid, to the maximum extent possible, any further disruption to this fish.

B. Wildlife Resources. Upper Penitencia Creek and its associated riparian forests provide a migration corridor for wildlife, which connects the riparian forests of Coyote Creek with the wildlands of the Diablo Range. While this corridor is degraded, it is the only migration corridor that can serve this function in this area. This corridor's value for wildlife

migration could be considerably enhanced if the continuity and quality of the riparian forest were improved.

6. PLANNING OBJECTIVE

The planning objective for this study is to reduce flood damages in the areas affected by flood flows from Upper Penitencia Creek in the vicinity of San Jose and Milpitas, while minimizing adverse impacts on fishery and wildlife resources.

III PLAN FORMULATION

1. GENERAL

This chapter describes the third, fourth, fifth, and sixth steps in the planning process. These include the formulation of the alternative plans, an evaluation of the effects of the candidate plans considered for further study, a comparison of these plans, and a recommendation for further study.

2. PLAN FORMULATION RATIONALE

The 1990 NRCS report considered four basic methods for reducing the repeated flood damages along Upper Penitencia Creek. The first method was to temporarily store storm flows in reservoirs and then release the flows at a rate which would not exceed the capacity of the existing creek. A second method was to construct a bypass channel. A third method was to increase the capacity of the creek itself. And the final option was to floodproof (i.e., modify or remove) the buildings in the threatened area.

These methods were reconsidered during this reconnaissance study. Three basic alternatives were developed to prevent or reduce flood damages, while staying within the constraints identified in Chapter II. For each alternative, three floodproofing variations were considered for a group of homes at the upstream end of the project area. The alternatives developed during this reconnaissance study incorporated three of the four methods presented by the NRCS in their 1990 report.

The first method proposed by the NRCS, flood control reservoirs, was excluded from further consideration due to reasons stated in the NRCS report. The steep and narrow canyons in the upstream portion of the watershed would restrict opportunities to build a single reservoir of sufficient storage. Thus, several small reservoirs would be required. Access road construction and slope stability would present potential obstacles to this option. Special design requirements to accommodate the Hayward Fault would also elevate the costs associated with this option.

The second method proposed by the NRCS, to construct a bypass channel, was included as an element of every alternative considered in this reconnaissance study. The proposed bypass would be constructed immediately adjacent to the creek on the north bank. Insufficient land is available to construct a vegetated earth channel which would be wide enough to pass flows at non-erosive velocities. Therefore, for most of the bypass, rock riprap would be used to protect the channel banks and bottom from erosion. The reach downstream of King road is in an industrial area with limited land available for a bypass.

Consequently, a narrower concrete-lined channel capable of passing faster flows is proposed for this reach.

The third NRCS option, to increase the capacity of the creek itself, was considered as part of Alternative 3 of this reconnaissance study. This method would consist of excavating the existing stream banks in order to widen the existing channel. Riprap would line the new channel in order to minimize erosion.

The final NRCS method, floodproofing existing buildings, would be prohibitively expensive if used for more than a limited number of structures. However, floodproofing was considered for 14 homes at the upstream end of the proposed project area, near Dorel Drive. For each alternative considered, three floodproofing measures were compared for these homes. The costs associated with raising the first floors of each home above the 100-year flood level was compared with the costs of providing a floodwall and removable driveway shields. These costs were compared, in turn, with providing no flood protection at all for these 14 homes.

3. PRELIMINARY PLANS

This section describes the preliminary plans and floodproofing measures which were considered for addressing the flooding problem. Of the three main plans considered, one (Alternative 1) was presented in the 1990 NRCS report. This plan was reevaluated by the San Francisco District, and two additional plans were developed and evaluated. Three floodproofing measures were considered for each of Alternative Plans 1, 2, and 3. In addition to these three plans, a no-action alternative has been considered. All of these plans are described below. See Appendix D for an illustration of each alternative.

The objective of each alternative is to provide protection against the 100-year flood event. Due to the absence of floodplains for events other than the 100-year flood, lesser levels of protection could not be adequately evaluated within the scope of this study, but would be evaluated in the next study phase.

A. No Action

In order to comply with the National Environmental Policy Act (NEPA), the Corps of Engineers is required to consider the option of no action as an alternative to the flooding problem. If no action were taken by either the Federal Government or local interests to alleviate the flooding problem along Upper Penitencia Creek, repeated flooding would continue. This plan would result in continued average annual flood damages in excess of $5 million in the San Jose/Milpitas area of the Upper Penitencia Creek watershed.

B. Alternative 1A: (Modified Floodplain with Bypass Downstream - Floodproofing/Raise Structures).

1. Description. This alternative was originally studied by the NRCS. The plan would provide a 100-year level of flood protection along approximately 3.5 miles of Upper Penitencia Creek by utilizing the elements described below. Appendix D shows the layout for Alternatives 1A, 1B, and 1C, described below.

(Elements are listed upstream to downstream.)

a) Reach One: Floodproofing Between Tallent Avenue and Noble Avenue. 100-year floodwaters in this reach run parallel to Upper Penitencia Creek. Higher ground to the north of the creek prevents flooding on the north bank. Flows cross Upper Penitencia Creek Road on the south bank and flood 14 homes between Tallent Avenue (the upstream limit of the project) and Noble Avenue. The first floors of these homes would be raised above the 100-year floodplain. The residents would be temporarily relocated during this process.

b) Reach Two: Floodwalls and Levees Between Noble Avenue and Capitol Avenue. Floodwaters flow primarily to the south of the creek above Piedmont Road, but flow north of the creek between Piedmont Road and Capitol Avenue. A combination of floodwalls and levees would contain overflows along 1.6 stream miles of the creek between Noble Avenue and Capitol Avenue.

i.) Noble Avenue to Piedmont Road: Floodwaters between Noble Avenue and Piedmont Road flow to the south, crossing Upper Penitencia Creek Road, flowing through Toyon School, and flooding homes a quarter of a mile away from the creek. The area which is flooded to the north is restricted to one of three SCVWD percolation ponds. These flows would be contained between a floodwall to the south of the creek and a combination of floodwalls and a levee to the north of the creek.

The south bank of this reach would consist of a 3,100-foot length of floodwall which would be built along the southern edge of Upper Penitencia Creek Road between Noble Avenue and Piedmont Road. The wall height would vary from 2 to 6 feet, and the width would be approximately 1 foot. The wall would pass between Upper Penitencia Creek Road and Toyon School.

The north bank of this reach would consist of alternating sections of floodwalls and levees. The floodwalls would all be one foot thick and vary in height between 2 and 5 feet. A short 200-ft section of floodwall would be built between Noble Avenue and the upstream end of the SCVWD percolation ponds. This would tie into a 1,600-foot section of levee adjacent to the percolation ponds. The top of the levee would be 18 feet wide,

and the sideslopes would be 1H on 3V. The levee would tie into another 1,500-foot section of floodwall between the downstream end of the percolation ponds and Piedmont Road.

ii.) Piedmont Road to Viceroy Way: The entire 100-year peak flow of 4,300 cfs would pass under the Piedmont Road bridge. Downstream of the bridge, floodwaters flow to the north of the creek through open parkland until they reach Summerdale School. There is only limited flooding to the south, adjacent to the creek, in this reach. Flows would be bound by a levee reach to the south and a levee/floodwall combination to the north.

Flows would be kept off of Upper Penitencia Creek Road to the south by an earthen levee between 2 and 5 feet high, with a minimum top width of 10 feet. This section of levee would be built along the northern edge of Upper Penitencia Creek Road between the road and the creek.

Flows would be contained to the north by a levee which would stretch 2,100 feet through Penitencia Creek Park up to Viceroy Way.

The creek crosses Upper Penitencia Creek Road just upstream of Viceroy Way via an existing culvert. This culvert would be replaced by a clear span bridge which would have the capacity to pass the entire 100-year flood flow (4,300 cfs). A private road crossing downstream of Upper Penitencia Creek Road (at Viceroy Way) would be removed in order to construct the levee and floodwall which would continue downstream of the new Upper Penitencia Creek bridge.

iii.) Viceroy Way to Capitol Avenue: Floodwaters in this reach flow to the north of the creek through Summerdale School until they reach Berryessa Road. They extend through a residential area about a quarter mile to the west of Summerdale School, where they then break out to the north once again. There is only limited flooding to the south, adjacent to the creek, in this reach.

Flows to the south of the creek would be contained by an earthen levee between 2 and 5 feet high. The levee would have a minimum top width of 18 feet and inside sideslopes of 1V on 3H and outside sideslopes of 2V on 5H. This section of the levee would be an extension of the levee upstream of the new bridge at Upper Penitencia Creek Road.

Flows to the north would be contained by a 3,300-foot section of floodwall between Viceroy Way and Capitol Avenue. This floodwall would be built between the creek and the southern edge of Upper Penitencia Creek Road, protecting the road during floods.

c) Reach Three: Rock-Lined Bypass Channel Between Capitol Avenue and King Road. Flows in this reach follow two distinct patterns. Flows break out to the north and to the south of the creek between Capitol Avenue and Interstate 680, flooding a narrow 1,000-foot wide area parallel to both of these roads. Floodwaters continue to the northwest, and eventually run parallel to Interstate 880.

Downstream of Interstate 680, there is limited flooding along the creek. However, some of the floodwaters which leave the creek banks between Viceroy Way and Capitol Avenue cross under Interstate 680 and run parallel to Berryessa Road down to King Road.

Flows would be split at Capitol Avenue to allow 1,000 cfs to flow through the natural creek channel. It would be necessary to excavate 400 lineal feet of the natural channel near Capitol Avenue to construct a diversion structure. The remaining 3,300 cfs would be directed to a 1.5-mile rock-lined bypass channel, which would be constructed between Capitol Avenue and King Road.

Between Jackson Avenue and King Road, the creek crosses under Mabury Road and flows along the south side of the road for approximately a quarter of a mile. The creek then loops back under Mabury Road and continues flowing to the west until it crosses under King Road. The bypass channel would remain on the northern side of Mabury Road.

Flows in the creek are restricted to 400 cfs at the upstream Mabury Road crossing. At this point, the 1,000 cfs in the creek channel would be split again, allowing 400 cfs to continue in the creek and diverting 600 cfs to the bypass channel. The bypass channel would convey 3,900 cfs downstream of this point. The channel would have side slopes of 1H on 5V and a bottom width of 50 feet.

d) Reach Four: Concrete-Lined Bypass Channel Between King Road and Coyote Creek. Below King Road, the floodwaters extend at least a half mile to the north and south of the creek before finally entering Coyote Creek. A 2,500-foot long concrete-lined bypass channel would continue to carry the 3,900 cfs flows from the rock-lined bypass channel directly to Coyote Creek (the downstream limit of the project). Flows would enter Coyote Creek approximately a quarter mile upstream of the confluence of Upper Penitencia Creek and Coyote Creek. 400 cfs would continue to flow in the natural creek channel and would enter Coyote Creek at its confluence with Upper Penitencia Creek.

The channel section between King Road and the Western Pacific Railroad (approximately 1,300 feet) would be a U-shaped channel with vertical sides and a bottom width of 36 feet. The remaining 1,200-foot section, between the railroad and Coyote

Creek, would be a trapezoidal channel with sideslopes of 1H on 1.5V and a bottom width of 25 feet. This design would require the construction of two triple box culverts in this reach. One culvert would be placed at the Western Pacific Railroad crossing, and the second culvert would be constructed at the King Road crossing. Both culverts would consist of three 12-foot (W) by 10-foot (H) boxes.

2. Evaluation of Effects.

Alternative 1A would provide a 100-year level of flood protection. No significant impacts on water quality or quantity are expected. Although some temporary noise and air quality impacts are unavoidable during construction, others may be reduced or mitigated depending on the equipment and other potential technologies or management practices used. No other impacts on the physical environment are expected.

Alternative 1A would have minimal biological impacts. Small losses of riparian forest (approximately 1 to 2 acres) may occur at the intake and outfall points for the bypass and at road crossings. These small losses would be easily mitigated. Construction of the bypass and floodwalls would cause the loss of some low-value ruderal habitat; this loss would not be significant and would require no mitigation.

Aquatic habitat is not expected to be significantly affected by Alternative 1A. Any loss of shaded riparian aquatic cover should be fully mitigated through plantings of riparian vegetation along currently barren streambanks.

The primary socioeconomic impact from Alternative 1A would be a major reduction in flood damages to structures and their contents, automobiles, and public facilities such as roads. The alternative would also create temporary construction jobs which would generate temporary and localized positive economic impacts. The residents of the 14 floodproofed homes would be temporarily relocated during the raising of their homes.

The aesthetic impacts of levees and bypass channels would be fairly minor. As the rock lining of the bypass channels would be covered with dirt and ruderal vegetation (by natural deposition and colonization), and as the levees would also be covered with ruderal vegetation, their visual impact would be minimal except in those locations where existing views of the creek corridor would be blocked by the levees. The floodwalls would have larger visual impacts due to their more angular and abrupt form.

Alternative 1A requires that a small area be excavated. Although the 1990 NRCS study found no known cultural resources in the creek corridor, the potential exists to disturb currently undocumented prehistoric cultural resources.

Coordination with federal and state resource agencies would be needed to ensure that the bypass would not have adverse impacts on migrating steelhead trout. Potential impacts on the red-legged frog and candidate species also would need to be addressed.

3. Cost Estimate. Table III-1 summarizes the first costs associated with Alternative 1A. First costs for Alternative 1A are $33,789,500. These costs include construction costs, mitigation costs, and real estate costs. Disposal costs, included in the excavation line item for construction costs, reflect the assumption that excavated material would be hauled to a locally identified borrow site located 12 miles from the project site. The Operation and Maintenance (O&M) costs which appear in Table III-10 (near the end of this chapter) are estimated at 1.5% of the total first costs (excluding real estate costs). This estimate is based on a cursory examination of O&M estimates used in past flood control studies.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and Benefit-to-Cost Ratios (BCRs) are presented in Table III-10, near the end of this chapter. The BCR for Alternative 1A is 1.71. Average annual benefits and costs were developed based upon a 100-year project lifetime at an amortization rate of 7.75%.

5. Implementation Responsibility. Implementation of Alternative 1A would require the local sponsor to contribute the following:

a) a cash contribution equal to 5% of the flood control construction costs;

b) all lands, easements, rights-of-way, relocations of roads and utilities (except railroad bridges) and suitable borrow disposal areas (referred to as LERRD);

c) if the sum of the above two items is less than 25% of the costs assigned to flood control, non-Federal sponsors would pay the difference in cash. However, total non-Federal costs shall not exceed 50% of the construction costs assigned to flood control.

The local sponsor is also required to operate and maintain the project after completion without cost to the United States; prevent future encroachment or modifications which might interfere with proper functioning of the project; and to participate in the National Flood Insurance Program and other applicable Federal floodplain management programs.

C. Alternative 1B: (Modified Floodplain with Bypass Downstream - Floodproofing/Floodwall).

1. Description. This alternative is identical to Alternative 1A with the exception of the floodproofing method.

Rather than raising the 14 existing homes in the extreme upstream portion of the study area, a floodwall would be constructed to protect these homes. This wall would begin at Tallent Avenue and would run downstream parallel to Upper Penitencia Creek Road for approximately 1,070 feet. The wall would be approximately 4 feet high and 1 foot wide. During flood events, 10 residences would be required to place 12 foot wide barriers across the floodwall openings at their driveways.

2. Evaluation of Effects. The effects of Alternative 1B are similar to those for Alternative 1A. During flood events, 10 residences would be required to take the action described above in order to protect their homes from flood damages.

3. Cost Estimate. Table III-2 summarizes the first costs associated with Alternative 1B. First costs for Alternative 1B are $31,129,800. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A. The BCR for Alternative 1B is 1.86.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 1B are identical to those for Alternative 1A.

D. Alternative 1C: (Modified Floodplain with Bypass Downstream - No Floodproofing).

1. Description. This alternative is identical to Alternatives 1A and 1B with the exception of the floodproofing method. In an effort to determine the incremental value of protecting these homes, this alternative eliminated floodproofing for the 14 homes between Tallent Avenue and Noble Avenue. No flood protection measures would be taken upstream of Noble Avenue.

2. Evaluation of Effects. The effects of Alternative 1C are similar to those for Alternatives 1A and 2A, above. This alternative would not provide any flood protection to the 14 homes at the upstream end of the study area. Thus, these homes would continue to suffer from flood damages.

3. Cost Estimate. Table III-3 summarizes the first costs associated with Alternative 1C. First costs for Alternative 1C are $30,704,000. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A above. The BCR for Alternative 1C is 1.88.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 1C are identical to those for Alternatives 1A and 1B.

E. Alternative 2A: (Modified Floodplain with Partial Bypass Downstream - Floodproofing/Raise Structures).

1. Description. Reaches One, Two, and Four of this alternative are the same as those for Alternative 1A. Reach Three differs from Alternative 1A between Capitol Avenue and the upstream creek crossing at Mabury Road. Rather than incorporating the bypass channel of Alternative 1A, the floodwalls and levees of Reach Two would continue throughout this section, and the rock-lined bypass channel would begin just above Mabury Road (instead of beginning at Capitol Avenue). Refer to Alternative 1A for descriptions of Reaches One, Two, and Four. Reach Three is described below. Appendix D shows the layout for Alternatives 2A, 2B, and 2C, described below.

a) Reach Three: Floodwall and Levee Combination From Capitol Avenue to Mabury Road and Rock-Lined Bypass Channel From Mabury Road to King Road. Flows in this reach follow two distinct patterns. Flows break out to the north and to the south of the creek between Capitol Avenue and Interstate 680, flooding a narrow 1,000-foot wide area parallel to both of these roads. Floodwaters continue to the northwest, and eventually run parallel to Interstate 880.

Downstream of Interstate 680, there is limited flooding along the creek. However, some of the floodwaters which leave the creek banks between Viceroy Way and Capitol Avenue cross under Interstate 680 and run parallel to Berryessa Road down to King Road.

Between Capitol Avenue and the creek's upstream crossing of Mabury Road, the entire 4,300 cfs associated with a 100-year event would be contained by a floodwall to the north and a levee to the south. A 4,400-foot long, one-foot wide, section of floodwall would be built on the north bank of the creek between Capitol Avenue and the upstream crossing of Mabury Road. A 4,400-foot long section of levee would be constructed on the south bank of the creek. The levee top would have a minimum width of 8 feet, and a sideslope of 1V to 3H. The height of both the levee and the floodwall would vary between 2 and 6 feet. The

levee and floodwall would tie into a 3,100-foot rock-lined bypass channel just upstream of Mabury Road.

Between Jackson Avenue and King Road, the creek crosses under Mabury Road and flows along the south side of the road for approximately a quarter of a mile. The creek then loops back under Mabury Road and continues flowing to the west until it crosses under King Road. The bypass channel would remain on the northern side of Mabury Road.

Flows in the creek are restricted to 400 cfs at the upstream Mabury Road crossing. At this point, the 4,300 cfs in the creek channel would be split, allowing 400 cfs to continue in the creek and diverting 3,900 cfs to the bypass channel. The bypass channel would convey 3,900 cfs downstream of this point. The channel would have side slopes of 1H on 5V and a bottom width of 50 feet. No excavation of the channel would be required for a diversion structure since the culvert under Mabury Road would restrict flows into the natural channel to 400 cfs. The levee would direct flows into the bypass channel and prevent flows from spilling out onto Mabury Road.

2. Evaluation of Effects.

Alternative 2A would provide a 100-year level of flood protection. Because Alternative 2A is so similar to Alternative 1A, the effects would be nearly identical. However, because Alternative 2A requires no excavation of the creek bed, the potential disturbance to currently undocumented prehistoric cultural resources is even less likely than for Alternative 1A. No significant impacts on water quality or quantity are expected. Although some temporary noise and air quality impacts are unavoidable during construction, others may be reduced or mitigated depending on the equipment and other potential technologies or management practices used. No other impacts on the physical environment are expected. As in Alternative 1A, the residents of the 14 floodproofed homes would be temporarily relocated during the raising of their homes.

3. Cost Estimate. Table III-4 summarizes the first costs associated with Alternative 2A. First costs for Alternative 2A are $27,013,400. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A above. The BCR for Alternative 2A is 2.15.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 2A are identical to those for Alternative 1A.

F. Alternative 2B: (Modified Floodplain with Partial Bypass Downstream - Floodproofing/Floodwall).

1. Description. This alternative is identical to Alternative 2A with the exception of the floodproofing method. Rather than raising the 14 existing homes in the extreme upstream portion of the study area, a floodwall would be constructed to protect these homes. See the discussion of Alternative 1B for details of the floodwall.

2. Evaluation of Effects. The effects of Alternative 2B are similar to those for Alternative 2A. During flood events, 10 residences would be required to place barriers at the floodwall openings across their driveways in order to protect their homes from flood damages.

3. Cost Estimate. Table III-5 summarizes the first costs associated with Alternative 2B. First costs for Alternative 2B are $24,352,200. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A above. The BCR for Alternative 2B is 2.39.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 2B are identical to those for Alternative 1A.

G. Alternative 2C: (Modified Floodplain with Partial Bypass Downstream - No Floodproofing).

1. Description. This alternative is identical to Alternatives 2A and 2B with the exception of the floodproofing method. In an effort to determine the incremental value of protecting these homes, this alternative eliminated floodproofing for the 14 homes between Tallent Avenue and Noble Avenue. No flood protection measures would be taken upstream of Noble Avenue.

2. Evaluation of Effects. The effects of Alternative 2C are similar to those for Alternatives 2A and 2B. This alternative would not provide any flood protection to the 14

homes at the upstream end of the study area. Thus, these homes would continue to suffer from flood damages.

3. Cost Estimate. Table III-6 summarizes the first costs associated with Alternative 2C. First costs for Alternative 2C are $23,927,900. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A above. The BCR for Alternative 2C is 2.43.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 2C are identical to those for Alternative 1A.

H. Alternative 3A (Trapezoidal Channel and Modified Floodplain with Partial Bypass Downstream - Floodproofing/Raise Structures).

1. Description. This alternative is the same as Alternative 1A except that the natural channel between Upper Penitencia Creek Road (at Viceroy Way) and Mabury Road would be excavated to a trapezoidal cross-section and lined with rock. This channel excavation would eliminate the need for levees and floodwalls through this section. A rock-lined bypass (similar in cross-section) would be constructed to join the excavated channels upstream of Mabury Road with the concrete-lined channel downstream of King Road. Reaches One and Four of this alternative are the same as those for Alternative 1A. Refer to Alternative 1A for descriptions of these reaches. Reaches Two and Three are described below. Appendix D shows the layout for Alternatives 3A, 3B, and 3C, described below.

a) Reach Two: Floodwalls and Levees Between Noble Avenue and Viceroy Way and Trapezoidal Channel From Viceroy Way to Mabury Road. This reach is identical to that described in Alternative 1A between Noble Avenue and Viceroy Way. Between Viceroy Way and Capitol Avenue, the floodwall/levee combination would be replaced with a 3,300-foot long trapezoidal channel with sideslopes of 1V on 5H and a bottom width of 50 feet. The natural creek bed would be excavated for its entire length between Viceroy Way and the upstream crossing at Mabury Road. This channel would convey the entire 4,300 cfs associated with a 100-year storm event.

b) Reach Three: Rock-Lined Bypass Channel From Mabury Road to King Road and Concrete-Lined Channel from King Road to Coyote Creek. The section of by-pass channel described in Alternative

1A between Capitol Avenue and Mabury Road would be replaced by the continuation of the trapezoidal channel described above. This channel would carry 4,300 cfs during a 100-year event.

The trapezoidal channel would tie into the bypass channel described in Alternative 1A. The bypass channel would extend from the upstream crossing at Mabury Road down to King Road, where it would tie into the concrete bypass channel in Reach Four. As described in Alternative 1A, 400 cfs would be split off at the Mabury Road culvert and carried by the natural creek channel to Coyote Creek. The bypass channel would convey the remaining 3,900 cfs to Coyote Creek.

2. Evaluation of Effects.

Alternative 3A would provide a 100-year level of flood protection. No significant impacts on water quality or quantity are expected. Although some temporary noise and air quality impacts are unavoidable during construction, others may be reduced or mitigated depending on the equipment and other potential technologies or management practices used. No other impacts on the physical environment are expected.

The effects of Alternative 3A on terrestrial ecosystems outside of the channelized reach would be similar to the effects associated with Alternatives 1A and 2A. However, within the channelized reach it would have serious negative impacts on riparian forest, with losses of this regionally scarce vegetation type likely to exceed 10 acres. Impacts on aquatic habitat and fish would be even more significant. The trapezoidal channel could be a significant barrier to steelhead trout migration; losses of streamside shade and holding areas for trout would also have significant negative impacts. Significant negative impacts on the red-legged frog could also occur.

Mitigation of riparian forest losses under this alternative would be possible but expensive, with costs exclusive of land probably exceeding $675,000. Full on-site mitigation of aquatic habitat impacts would be difficult and very costly under this alternative.

The primary socioeconomic impact from Alternative 3A would be a major reduction in flood damages to structures and their contents, automobiles, and public facilities such as roads. This alternative would also create temporary construction jobs resulting in temporary and localized positive economic impacts. The residents of the 14 floodproofed homes would be temporarily relocated during the raising of their homes.

In addition to the aesthetic impacts associated with Alternatives 1A and 2A above, the trapezoidal channel proposed in Alternative 3A would have strong visual impacts due to the

permanent removal of up to 8,000 linear feet of riparian vegetation. This impact could be largely mitigated through the planting of trees outside of the new channel, although the end result would still not be as visually appealing at close range as the present stream environment. It is important to note that such plantings would be for aesthetic purposes and would not provide adequate mitigation for loss or degradation of riparian and aquatic habitats.

Alternative 3A has the greatest potential to disturb currently undocumented prehistoric cultural resources given the greater amount of excavation that would be required under this alternative.

3. Cost Estimate. Table III-7 summarizes the first costs associated with Alternative 3A. First costs for Alternative 3A are $37,841,000. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A above. The BCR for Alternative 3A is 1.52.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 3C are identical to those for Alternative 1A.

I. Alternative 3B: (Trapezoidal Channel and Modified Floodplain with Partial Bypass Downstream - Floodproofing/Floodwall).

1. Description. This alternative is identical to Alternative 3A with the exception of the floodproofing method. Rather than raising the 14 existing homes in the extreme upstream portion of the study area, a floodwall would be constructed to protect these homes. See the section on Alternative 1B for details associated with the floodwall.

2. Evaluation of Effects. The effects of Alternative 3B are similar to those for Alternative 3A. During flood events, 10 residences would be required to take the action described above in order to protect their homes from flood damages.

3. Cost Estimate. Table III-8 summarizes the first costs associated with Alternative 3B. First costs for Alternative 3B are $35,184,200. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A above. The BCR for Alternative 3B is 1.64.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 3B are identical to those for Alternative 1A.

J. Alternative 3C: (Trapezoidal Channel and Modified Floodplain with Partial Bypass Downstream - No Floodproofing).

1. Description. This alternative is identical to Alternatives 3A and 3B with the exception of the floodproofing method. In an effort to determine the incremental value of protecting these homes, this alternative eliminated floodproofing for the 14 homes between Tallent Avenue and Noble Avenue. No flood protection measures would be taken upstream of Noble Avenue.

2. Evaluation of Effects. The effects of Alternative 3C are similar to those for Alternatives 3A and 3B. During flood events, 10 residences would be required to place barriers at the floodwall openings across their driveways in order to protect their homes from flood damages.

3. Cost Estimate. Table III-9 summarizes the first costs associated with Alternative 3C. First costs for Alternative 3C are $34,755,400. For an explanation of the total costs, see the Cost Estimate discussion under Alternative 1A above.

4. Net Benefits and Benefit-to-Cost Ratio. Annual costs, net benefits, and BCRs for each alternative are presented in Table III-10 near the end of this chapter. For a discussion of these costs, see the Net Benefits and Benefit-to-Cost Ratio section for Alternative 1A above. The BCR for Alternative 3C is 1.66.

5. Implementation Responsibility. The implementation responsibilities associated with Alternative 3C are identical to those for Alternative 1A.

TABLE III-1
COST ESTIMATE
ALTERNATIVE 1A

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	340,610	CY	5.99	2,040,254
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	58,000	SY	5.73	332,340
4	Compacted Fill	95,010	CY	3.55	337,286
5	Riprap 18" Rock	95,450	TON	44.00	4,199,800
6	Filter Material	10,230	TON	53.00	542,190
7	House Raising	14	EA	120000.00	1,680,000
8	Road Demolition	1,900	SY	15.39	29,241
9	Reinforced Concrete	11,280	CY	450.00	5,076,000
10	Uncompacted Fill	18,710	CY	1.12	20,955
11	Relocation of Utilities		JOB		287,250
12	Site Preparation	56	ACR	2000.00	112,000
13	Concrete Bridge	1,380	CY	570.00	786,600
		SUBTOTAL			15,524,451
		OVERHEAD	@ 15%		2,328,668
		SUBTOTAL			17,853,119
		PROFIT	@ 10%		1,785,312
		SUBTOTAL			19,638,431
		BOND	@ 1%		196,384
		SUBTOTAL			19,834,815
		CONTINGENCY	@ 25%		4,958,704
		SUBTOTAL			24,793,519
		ENGR/DESIGN	@ 7%		1,735,546
		SUPER/ADMIN	@ 8%		1,983,481
		SUBTOTAL			28,512,546
		MITIGATION COSTS			177,000
		LERRDS			5,100,000
		TOTAL (Rounded)			**$ 33,789,500**

TABLE III-2
COST ESTIMATE
ALTERNATIVE 1B

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	341,460	CY	5.99	2,045,345
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	58,000	SY	5.73	332,340
4	Compacted Fill	95,610	CY	3.55	339,416
5	Riprap 18" Rock	95,450	TON	44.00	4,199,800
6	Filter Material	10,230	TON	53.00	542,190
7	Water Barriers	10	EA	5000.00	50,000
8	Road Demolition	1,900	SY	15.39	29,241
9	Reinforced Concrete	11,668	CY	450.00	5,250,600
10	Uncompacted Fill	18,710	CY	1.12	20,955
11	Relocation of Utilities		JOB		287,250
12	Site Preparation	56	ACR	2000.00	112,000
13	Concrete Bridge	1,380	CY	570.00	786,600
		SUBTOTAL			14,076,272
		OVERHEAD	@ 15%		2,111,441
		SUBTOTAL			16,187,713
		PROFIT	@ 10%		1,618,771
		SUBTOTAL			17,806,484
		BOND	@ 1%		178,065
		SUBTOTAL			17,984,549
		CONTINGENCY	@ 25%		4,496,137
		SUBTOTAL			22,480,686
		ENGR/DESIGN	@ 7%		1,573,648
		SUPER/ADMIN	@ 8%		1,798,455
		SUBTOTAL			25,852,789
		MITIGATION COSTS			177,000
		LERRDS			5,100,000
		TOTAL (Rounded)			**$ 31,129,800**

TABLE III-3
COST ESTIMATE
ALTERNATIVE 1C

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	340,610	CY	5.99	2,040,254
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	58,000	SY	5.73	332,340
4	Compacted Fill	95,010	CY	3.55	337,286
5	Riprap 18" Rock	95,450	TON	44.00	4,199,800
6	Filter Material	10,230	TON	53.00	542,190
7	Road Demolition	1,900	SY	15.39	29,241
8	Reinforced Concrete	11,280	CY	450.00	5,076,000
9	Uncompacted Fill	18,710	CY	1.12	20,955
10	Relocation of Utilities		JOB		287,250
11	Site Preparation	56	ACR	2000.00	112,000
12	Concrete Bridge	1,380	CY	570.00	786,600
		SUBTOTAL			13,844,451
		OVERHEAD	@ 15%		2,076,668
		SUBTOTAL			15,921,119
		PROFIT	@ 10%		1,592,112
		SUBTOTAL			17,513,231
		BOND	@ 1%		175,132
		SUBTOTAL			17,688,363
		CONTINGENCY	@ 25%		4,422,091
		SUBTOTAL			22,110,454
		ENGR/DESIGN	@ 7%		1,547,732
		SUPER/ADMIN	@ 8%		1,768,836
		SUBTOTAL			25,427,022
		MITIGATION COSTS			177,000
		LERRDS			5,100,000
		TOTAL (Rounded)			**$ 30,704,000**

TABLE III-4
COST ESTIMATE
ALTERNATIVE 2A

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	168,570	CY	5.07	854,650
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	58,000	SY	5.73	332,340
4	Compacted Fill	84,980	CY	3.55	301,679
5	Riprap 18" Rock	38,970	TON	44.00	1,714,680
6	Filter Material	4,110	TON	53.00	217,830
7	House Raising	14	EA	120,000.00	1,680,000
8	Road Demolition	1,900	SY	15.39	29,241
9	Reinforced Concrete	12,140	CY	450.00	5,463,000
10	Uncompacted Fill	6,990	CY	1.12	7,829
11	Relocation of Utilities		JOB		302,928
12	Site Preparation	40	ACR	2000.00	80,000
13	Concrete Bridge	1,380	CY	570.00	786,600
			SUBTOTAL		11,851,312
			OVERHEAD @ 15%		1,777,697
			SUBTOTAL		13,629,009
			PROFIT @ 10%		1,362,901
			SUBTOTAL		14,991,910
			BOND @ 1%		149,919
			SUBTOTAL		15,141,829
			CONTINGENCY @ 25%		3,785,457
			SUBTOTAL		18,927,286
			ENGR/DESIGN @ 7%		1,324,910
			SUPER/ADMIN @ 8%		1,514,183
			SUBTOTAL		21,766,379
			MITIGATION COSTS		147,000
			LERRDS		5,100,000
			TOTAL (Rounded)		**$ 27,013,400**

TABLE III-5
COST ESTIMATE
ALTERNATIVE 2B

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	169,420	CY	5.07	858,959
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	58,000	SY	5.73	332,340
4	Compacted Fill	85,580	CY	3.55	303,809
5	Riprap 18" Rock	38,970	TON	44.00	1,714,680
6	Filter Material	4,110	TON	53.00	217,830
7	Water Barriers	10	EA	5000.00	50,000
8	Road Demolition	1,900	SY	15.39	29,241
9	Reinforced Concrete	12,528	CY	450.00	5,637,600
10	Uncompacted Fill	6,990	CY	1.12	7,829
11	Relocation of Utilities		JOB		302,928
12	Site Preparation	40	ACR	2000.00	80,000
13	Concrete Bridge	1,380	CY	570.00	786,600
		SUBTOTAL			10,402,351
		OVERHEAD	@ 15%		1,560,353
		SUBTOTAL			11,962,704
		PROFIT	@ 10%		1,196,270
		SUBTOTAL			13,158,974
		BOND	@ 1%		131,590
		SUBTOTAL			13,290,564
		CONTINGENCY	@ 25%		3,322,641
		SUBTOTAL			16,613,205
		ENGR/DESIGN	@ 7%		1,162,924
		SUPER/ADMIN	@ 8%		1,329,056
		SUBTOTAL			19,105,185
		MITIGATION COSTS			147,000
		LERRDS			5,100,000
		TOTAL (Rounded)			**$ 24,352,200**

TABLE III-6
COST ESTIMATE
ALTERNATIVE 2C

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	168,570	CY	5.07	854,650
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	58,000	SY	5.73	332,340
4	Compacted Fill	84,980	CY	3.55	301,679
5	Riprap 18" Rock	38,970	TON	44.00	1,714,680
6	Filter Material	4,110	TON	53.00	217,830
7	Road Demolition	1,900	SY	15.39	29,241
8	Reinforced Concrete	12,140	CY	450.00	5,463,000
9	Uncompacted Fill	6,990	CY	1.12	7,829
10	Relocation of Utilities		JOB		302,928
11	Site Preparation	40	ACR	2000.00	80,000
12	Concrete Bridge	1,380	CY	570.00	786,600
		SUBTOTAL			10,171,312
		OVERHEAD	@ 15%		1,525,697
		SUBTOTAL			11,697,009
		PROFIT	@ 10%		1,169,701
		SUBTOTAL			12,866,710
		BOND	@ 1%		128,667
		SUBTOTAL			12,995,377
		CONTINGENCY	@ 25%		3,248,844
		SUBTOTAL			16,244,221
		ENGR/DESIGN	@ 7%		1,137,095
		SUPER/ADMIN	@ 8%		1,299,538
		SUBTOTAL			18,680,854
		MITIGATION COSTS			147,000
		LERRDS			5,100,000
		TOTAL (Rounded)			**$ 23,927,900**

TABLE III-7
COST ESTIMATE
ALTERNATIVE 3A

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	467,870	CY	6.88	3,218,946
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	55,450	SY	5.73	317,729
4	Compacted Fill	69,160	CY	3.55	245,518
5	Riprap 18" Rock	132,970	TON	44.00	5,850,680
6	Filter Material	14,402	TON	53.00	763,306
7	House Raising	14	EA	120,000.00	1,680,000
8	Road Demolition	1,900	SY	15.39	29,241
9	Reinforced Concrete	9,900	CY	450.00	4,455,000
10	Uncompacted Fill	27,500	CY	1.12	30,800
11	Relocation of Utilities		JOB		287,250
12	Site Preparation	62	ACR	2000.00	124,000
13	Concrete Bridge	660	CY	570.00	376,200
			SUBTOTAL		17,459,205
			OVERHEAD @ 15%		2,618,881
			SUBTOTAL		20,078,086
			PROFIT @ 10%		2,007,809
			SUBTOTAL		22,085,894
			BOND @ 1%		220,859
			SUBTOTAL		22,306,753
			CONTINGENCY @ 25%		5,576,688
			SUBTOTAL		27,883,442
			ENGR/DESIGN @ 7%		1,951,841
			SUPER/ADMIN @ 8%		2,230,675
			SUBTOTAL		32,065,958
			MITIGATION COSTS		675,000
			LERRDS		5,100,000
			TOTAL (Rounded)		**$ 37,841,000**

TABLE III-8
COST ESTIMATE
ALTERNATIVE 3B

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	468,720	CY	6.88	3,224,794
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	55,450	SY	5.73	317,729
4	Compacted Fill	69,760	CY	3.55	247,648
5	Riprap 18" Rock	132,970	TON	44.00	5,850,680
6	Filter Material	14,402	TON	53.00	763,306
7	Water Barriers	10	EA	5000.00	50,000
8	Road Demolition	1,900	SY	15.39	29,241
9	Reinforced Concrete	10,290	CY	450.00	4,630,500
10	Uncompacted Fill	27,500	CY	1.12	30,800
11	Relocation of Utilities		JOB		287,250
12	Site Preparation	62	ACR	2000.00	124,000
13	Concrete Bridge	660	CY	570.00	376,200
		SUBTOTAL			16,012,683
		OVERHEAD	@ 15%		2,401,902
		SUBTOTAL			18,414,585
		PROFIT	@ 10%		1,841,459
		SUBTOTAL			20,256,044
		BOND	@ 1%		202,560
		SUBTOTAL			20,458,604
		CONTINGENCY	@ 25%		5,114,651
		SUBTOTAL			25,573,256
		ENGR/DESIGN	@ 7%		1,790,128
		SUPER/ADMIN	@ 8%		2,045,860
		SUBTOTAL			29,409,244
		MITIGATION COSTS			675,000
		LERRDS			5,100,000
		TOTAL (Rounded)			**$ 35,184,200**

TABLE III-9
COST ESTIMATE
ALTERNATIVE 3C

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Excavation	467,870	CY	6.88	3,218,946
2	Fence	5,900	LF	13.65	80,535
3	Gravel Road	55,450	SY	5.73	317,729
4	Compacted Fill	69,160	CY	3.55	245,518
5	Riprap 18" Rock	132,970	TON	44.00	5,850,680
6	Filter Material	14,402	TON	53.00	763,306
7	Road Demolition	1,900	SY	15.39	29,241
8	Reinforced Concrete	9,900	CY	450.00	4,455,000
9	Uncompacted Fill	27,500	CY	1.12	30,800
10	Relocation of Utilities		JOB		287,250
11	Site Preparation	62	ACR	2000.00	124,000
12	Concrete Bridge	660	CY	570.00	376,200
		SUBTOTAL			15,779,205
		OVERHEAD	@ 15%		2,366,881
		SUBTOTAL			18,146,086
		PROFIT	@ 10%		1,814,609
		SUBTOTAL			19,960,694
		BOND	@ 1%		199,607
		SUBTOTAL			20,160,301
		CONTINGENCY	@ 25%		5,040,075
		SUBTOTAL			25,200,377
		ENGR/DESIGN	@ 7%		1,764,026
		SUPER/ADMIN	@ 8%		2,016,030
		SUBTOTAL			28,980,433
		MITIGATION COSTS			675,000
		LERRDS			5,100,000
		TOTAL (Rounded)			**$ 34,755,400**

TABLE III–10
AVERAGE ANNUAL COSTS,
NET BENEFITS, AND
BENEFIT–TO–COST RATIOS

Alt	Construction Cost	Project First Cost (w/ Real Est)	Interest and Amortization (i = 7.75%)	Operation and Maintenance (1.5%)	Average Annual Costs	Average Annual Benefits	Net Benefits	Benefit to Cost Ratio
1A	$28,512,500	$33,789,500	$2,620,000	$427,700	$3,047,700	$5,200,000	$2,152,300	1.71
1B	$25,852,800	$31,129,800	$2,413,800	$387,800	$2,801,600	$5,200,000	$2,398,400	1.86
1C	$25,427,000	$30,704,000	$2,380,800	$381,400	$2,762,200	$5,200,000	$2,437,800	1.88
2A	$21,766,400	$27,013,400	$2,094,600	$326,500	$2,421,100	$5,200,000	$2,778,900	2.15
2B	$19,105,200	$24,352,200	$1,888,300	$286,600	$2,174,800	$5,200,000	$3,025,200	2.39
2C	$18,680,900	$23,927,900	$1,855,400	$280,200	$2,135,600	$5,200,000	$3,064,400	2.43
3A	$32,066,000	$37,841,000	$2,934,200	$481,000	$3,415,200	$5,200,000	$1,784,800	1.52
3B	$29,409,200	$35,184,200	$2,728,200	$441,100	$3,169,300	$5,200,000	$2,030,700	1.64
3C	$28,980,400	$34,755,400	$2,694,900	$434,700	$3,129,600	$5,200,000	$2,070,400	1.66

4. COMPARISON OF ALTERNATIVES

This section compares the alternative plans presented above. The major elements of the plans are summarized and compared in terms of their contributions to the four accounts of National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE). The alternative plans are then tested against four specific evaluation criteria described below. The identification of the plan(s) that establishes Federal interest is also made.

A. System of Accounts: Four accounts are established to facilitate evaluation and display the effects of the alternative plans. These accounts are described below.

1) National Economic Development (NED)

The NED account shows the effects on the national economy. Project cost comparisons and benefit-to-cost comparisons are included under this account.

2) Environmental Quality (EQ)

The EQ account shows the effects on ecological, cultural, and aesthetic attributes of significant natural and cultural resources that cannot be measured in monetary terms. The findings of the Environmental Assessment indicate that an Environmental Impact Statement (EIS) is recommended during the Feasibility Study.

3) Regional Economic Development (RED)

The RED account shows the regional effects the proposed plans could have on regional economic activity.

4) Other Social Effects (OSE)

The OSE account shows the project's urban and community impacts and effects on life, health, and safety.

B. Associated Evaluation Criteria: During plan evaluation, the alternative plans are tested against four specified criteria. These criteria are defined in the following paragraphs.

Acceptability. The acceptability of a plan is determined through evaluating its acceptance by the concerned public. A plan is acceptable if it is, or would likely be, supported by a significant segment of the public.

Completeness. Plan completeness is determined by analyzing whether all necessary investments or other actions necessary to attain the full plan have been included.

Effectiveness. Plan effectiveness is determined by analyzing how well it satisfies the planning objective and contributes to the System of Accounts.

Efficiency. The efficiency of a plan is its ability to achieve the planning objective and the NED outputs in the least costly manner.

C. Trade-Off Analysis: The trade-off analysis compares how the implementation of each alternative is distinguished from all other alternatives. The trade-offs considered include the achievement of the study planning objective, the economic benefits versus the costs associated with implementation, and the environmental and other social effects associated with each alternative.

The No-Action Alternative would not meet the planning objective to reduce flood damages. No costs, economic benefits, or environmental impacts would result from this alternative.

Six of the remaining alternatives meet the planning objective to reduce flood damages, while also satisfying the System of Accounts. Alternatives 3A, 3B, and 3C do not satisfy the Environmental Quality Account. Table III-11 summarizes the impacts associated with each alternative.

D. Plans Carried Forward for Further Consideration: Excluding the No-Action Alternative, Alternatives 1 and 2 would provide protection from the 100-year event while also satisfying the System of Accounts. However, Alternatives 1C and 2C exclude floodproofing measures and would not provide flood protection for 14 homes in the extreme upstream portion of the project area.

Although Alternatives 3A, 3B, and 3C would provide protection from the 100-year flood event, there are major adverse environmental impacts associated with these plans. In addition, the mitigation costs associated with Alternative 3 do not include the land costs required for mitigation planting. Therefore, the BCRs associated with these alternatives are artificially high. Thus, only Alternatives 1 and 2, meet the planning objective (with the exception of 14 homes for Alternatives 1C and 2C) and also satisfy the System of Accounts. Therefore, it is recommended that Alternatives 1 and 2 be carried forward for further consideration.

TABLE III–11
SUMMARY OF COMPARISON
OF ALTERNATIVES

	NO ACTION ALTERNATIVE	ALTERNATIVE 1 Modified Floodplain Downstream Bypass	ALTERNATIVE 2 Modified Floodplain Partial Bypass	ALTERNATIVE 3 Modified Floodplain Trapezoidal Channel
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT				
Beneficial Impacts				
– Average Annual Flood Damage Reductions	No change from existing conditions.	$5,200,000	$5,200,000	$5,200,000
Adverse Impacts	No change from existing conditions.	None.	None.	None.
Annual Costs & Benefits				
– Total Avg Annual Costs	No change from existing conditions.	$2,762,200 to $3,047,700	$2,135,600 to $2,421,100	$3,129,600 to $3,415,200
– Total Net Benefits	No change from existing conditions.	$2,152,300 to $2,437,800	$2,778,900 to $3,064,400	$1,784,800 to $2,070,400
– Benefit–To–Cost Ratio	No change from existing conditions.	1.71 to 1.88	2.15 to 2.43	1.52 to 1.66
ENVIRONMENTAL QUALITY ACCOUNT				
Physical Environment	No change from existing conditions.	100–yr flood protection, temporary noise & air pollution from construction	100–yr flood protection, temporary noise & air pollution from construction	100–yr flood protection, temporary noise & air pollution from construction
Biological Environment	No change from existing conditions.	1.7 acre riparian habitat loss. 3.4 acres mitigation planting.	1.2 acre riparian habitat loss. 2.4 acres mitigation planting.	10 acre riparian habitat loss. 20 acres mitigation planting. Aquatic hab loss.
Cultural Resources	No change from existing conditions.	Moderate potential to disturb cultural resources. (None known to exist.)	Least potential to disturb cultural resources. (None known to exist.)	Greatest potential to disturb cultural resources. (None known to exist.)

TABLE III–11
(CONTINUED)

REGIONAL ECONOMIC DEVELOPMENT ACCOUNT				
Local Government Finance	No change from existing conditions.	SCVWD to provide non–Federal share of funds.	SCVWD to provide non–Federal share of funds.	SCVWD to provide non–Federal share of funds.
Economic Development	No change from existing conditions.	Some additional employ–ment during construction.	Some additional employ–ment during construction.	Some additional employ–ment during construction.
Industrial Growth	No change from existing conditions.	Reduce flood damages & interruptions to business.	Reduce flood damages & interruptions to business.	Reduce flood damages & interruptions to business.
Population Growth	No change from existing conditions.	No significant growth. Region highly developed.	No significant growth. Region highly developed.	No significant growth. Region highly developed.
OTHER SOCIAL IMPACTS				
Public Health and Safety	No change from existing conditions.	Flood threats reduced for events <= 100–yr.	Flood threats reduced for events <= 100–yr.	Flood threats reduced for events <= 100–yr.
Aesthetics	No change from existing conditions.	Floodwalls could present graffiti opportunities.	Floodwalls could present graffiti opportunities.	Floodwalls could present graffiti opportunities.
Recreation	No change from existing conditions.	Project will not obstruct access to park bike paths.	Project will not obstruct access to park bike paths.	Project will not obstruct access to park bike paths.
PLAN RESPONSE TO ASSOCIATED EVALUATION CRITERIA				
Acceptiability		No issues.	No issues.	Unacceptable environ–mental impacts.
Completeness		No issues.	No issues.	No issues.
Effectiveness		Meets flood protection objective. Satisfies System of Accounts.	Meets flood protection objective. Satisfies System of Accounts.	Meets flood protection objective. Does not satisfy EQ Account.
Efficiency		Meets NED Account requirements.	Meets NED Account requirements.	Meets NED Account requirements.

IV TECHNICAL CONSIDERATIONS

1. GENERAL

Technical criteria used in the design process are in accordance with standard guidelines and practices of the Corps of Engineers. Various aspects of the design are described in the following sections.

2. DESIGN CRITERIA

A. Discharge vs. Frequency Analysis

As part of the NRCS's basin hydrology analysis of Upper Penitencia Creek, a discharge versus frequency curve was developed for the creek near Dorel Drive. This curve is based on several years of historical data and 19 years of record from the U.S. Geological Survey (USGS) stream gage on Upper Penitencia Creek at San Jose (drainage area = 21.5 square miles). The curve reflects existing basin development, which is expected to remain essentially unchanged for about the next 20 years. Discharge versus frequency data (which does not include an adjustment for expected probability) is presented in the table below.

Upper Penitencia Creek Near Dorel Drive
Drainage Area = 21.5 square miles
Discharge versus Frequency Data

Recurrence Interval	Peak Discharge(cfs)
5-Year	1,300
10-Year	1,850
25-Year	2,700
50-Year	3,500
100-Year	4,300
500-Year	6,100

B. Existing Floodplains

Within the channel, the NRCS computed flood elevations using the Corps' water surface profile program, HEC-2, supplemented by manual calculations. Overland flow in the floodplain was modeled using the NRCS' TR-20 hydrologic computer program in conjunction with topographic information obtained from 2-foot contour topographic maps.

The NRCS developed floodplain maps were used to quantify the flood damages from Upper Penitencia Creek. The hydraulic analysis used by the NRCS in the development of these floodplain maps varied somewhat from the analysis used for the development of floodplain maps of the same area for the Federal Emergency

Management Agency (FEMA). The NRCS hydraulic analysis considered only Upper Penitencia Creek, Sierra Creek, and Dutard Creek, while the FEMA floodplains were developed with all pertinent water courses considered. The analysis used by the NRCS to determine the peak flows for significant events, incorporated both 47 years of historical data and 19 years of gage data. The FEMA peak flows for Upper Penitencia Creek were developed using gauge data only. The differences between the NRCS and FEMA hydrologic/hydraulic analysis of the Upper Penitencia watershed is a NRCS floodplain that is less extensive than the FEMA floodplain and NRCS peak flows that are higher than the FEMA peak flows.

Variation in the peak flow analyses is not uncommon, as stated in the Guidelines for Determining Flood Flow Frequency, Bulletin 17B, "Flood events ... do not fit any one specific known statistical distribution." Therefore, occasionally, the recommended techniques may not always provide the best or only fit to the data. But, as pointed out in the Hydrologic Frequency Analysis Manual, "When it is necessary to use a procedure that departs from Bulletin 17B, the procedure should be fundamentally sound and the steps of the procedure documented in the report ..." The methods used by the NRCS to determine the peak flows for flood events appear to be based on sound engineering practice and are fully documented in the NRCS document, Upper Penitencia Hydrology, Book 1.

Using recorded peak discharge data (1958, 1962 to 1995) from the Upper Penitencia Creek stream gage at San Jose, the San Francisco District conducted a flood frequency analysis assuming a logarithmic Pearson type III distribution for the data. The results from this analysis are compared to the FEMA and NRCS peak discharge results in the table below. It is apparent that the NRCS discharges are more conservative (higher) than the FEMA results and less conservative (lower) than the Log Pearson III analysis results, which would indicate that the NRCS discharges are within an acceptable range for the purposes of a reconnaissance phase study.

As a result of excluding certain tributaries of Upper Penitencia Creek from the floodplain analysis, the NRCS floodplain is not as extensive as the FEMA floodplain despite the larger flows used in the NRCS floodplain analysis. Use of the less extensive floodplain suggests that potential flood damages, and hence project benefits may be underestimated. Therefore, the benefits of the Upper Penitencia Creek Flood Control Project could only be increased as a result of basing the economic analysis on FEMA floodplain maps. The analysis presented in this report is based upon the floodplains developed by NRCS.

Comparison of Peak Discharges (cfs) for Upper Penitencia Creek			
Frequency of Occurrence (years)	FEMA 1988 FIS	NRCS 1990 Analysis	San Francisco Dist. Log Pearson III Analysis (n=21)
10	1,400	1,850	1,700
50	2,940	3,500	3,680
100	3,600	4,300	4,640
500	5,170	6,100	6,960

1) Without Project Channel Capacity. Between Dorel Drive and the culvert at Penitencia Creek Road, the creek's capacity is approximately 1,000 cfs; although, another culvert just downstream at Viceroy Way can carry almost 2,000 cfs. As the creek continues downstream across the urbanized valley floor, its capacity decreases to about 500 cfs near King Road and on downstream. However, a small reach between Capitol Avenue and Interstate 680 has a capacity of about 1,400 cfs.

2) 100- and 500-Year Floodplains. For their 1990 study, NRCS generated the 100-year and 500-year floodplains for Upper Penitencia Creek under existing conditions. These floodplains are shown in Appendix E.

During floods, most of the flows are directed to the north of Upper Penitencia Creek. Under 100-year storm conditions, flood flows (4,300 cfs) follow along the natural channel until they reach the vicinity of Viceroy Way, where about 2,300 cfs leave the creek and flow northwest through Summerdale School. This flow then continues down Berryessa Road and various other streets to Interstate 680. The remaining flow, 2,000 cfs, continues along the natural channel to Capitol Avenue where the existing channel capacity decreases to roughly 1,450 cfs. At this point, excess flow (550 cfs) is split to the south between Capitol Avenue and Interstate 680, and to the north to join upstream floodwaters. See Appendix E, (Map B) for these areas.

At this juncture, approximately 2,200 cfs flow northwest along the interstate to the Capitol Avenue undercrossing. Flow then passes through a residential area, crosses Montague Expressway and then continues northward between Interstate 880 and Abel Avenue. The flow crosses Calaveras Boulevard and continues through a subdivision. It is at this location that floodwaters begin to pond until they cross Interstate 880 and enter Coyote Creek. See Appendix E (Map A) for these areas.

Under 100-year storm conditions, much of the flooding between Interstate 680 and King Road remains in the neighborhood streets or near the channel. However, flows downstream of King Road overflow the streets flooding an industrial area before finally entering Coyote Creek (see Figure Appendix E (Map A)).

3) Other Floodplains. Neither the NRCS nor the SCVWD have floodplains for events other than the 100- and 500-year storms. However, maps of the areas flooded by the recent January 1995 storm are available. This storm resulted in a peak flow of about 1,100 cfs (approximately a 4-year event) on Upper Penitencia Creek. Although flood maps are available for the January 1995 event, no damage data is available for the storm at this time. SCVWD is currently preparing a flood report.

C. Influence of Proposed Project on Coyote Creek Flood Flows

A comparison of 100-year discharge hydrographs for Coyote Creek and Upper Penitencia Creek, under project conditions, indicates that Upper Penitencia Creek peaks long before Coyote Creek (approximately 48 hours), thus minimizing its additive effect to the peak flow on Coyote Creek. Therefore, it can be concluded that the project will not significantly increase the expected peak flow on Coyote Creek (See Figure 2). Note that the increase in *peak* discharge for Coyote Creek, as indicated in Figure 2, is due to future development, and not due to the proposed project on Upper Penitencia Creek.

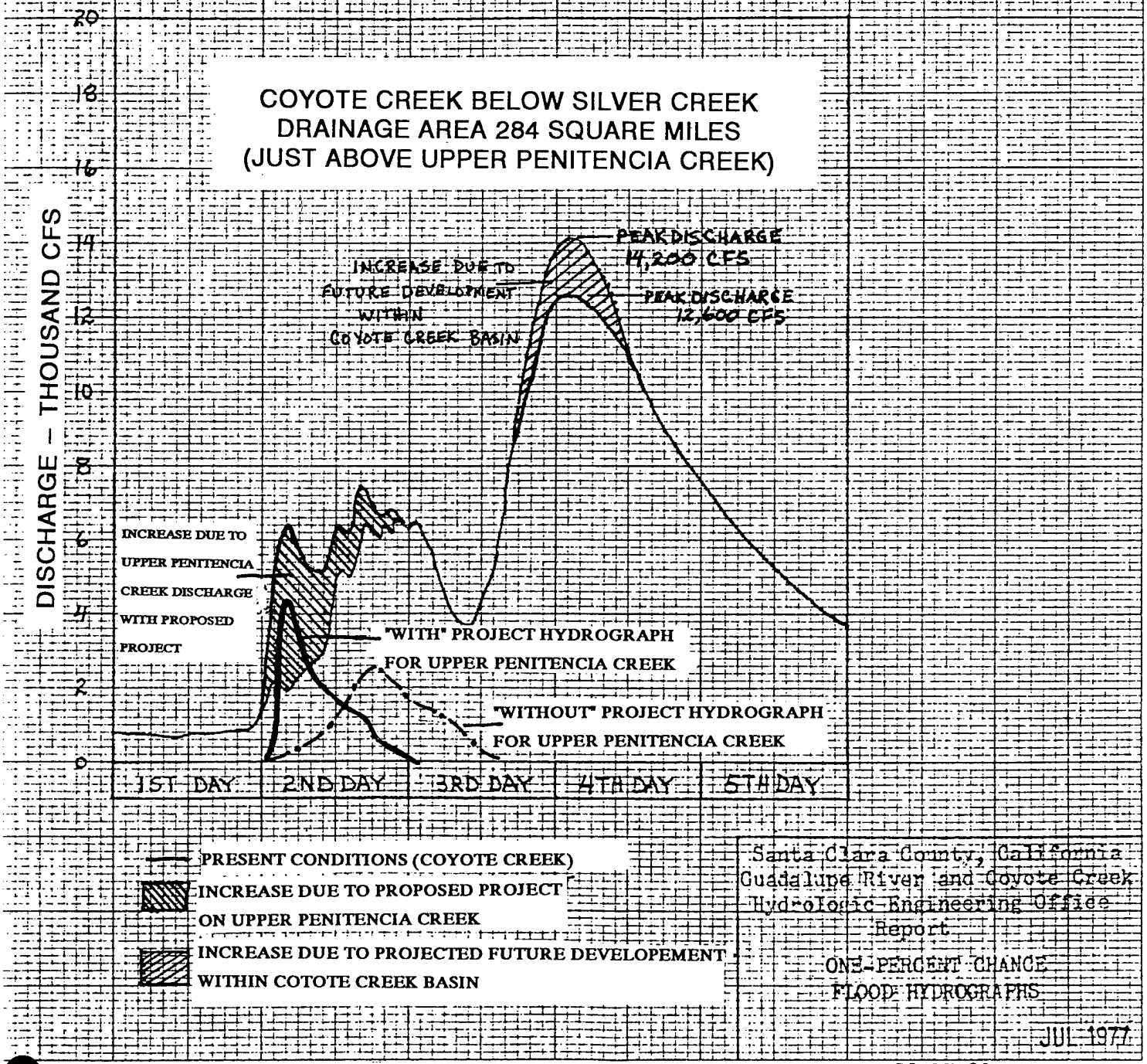
Regarding concerns with flows from Coyote Creek backing up into Upper Penitencia Creek, this is not expected to happen to a significant extent since there is enough of a physical drop in the channel invert from Upper Penitencia Creek to Coyote Creek.

D. Effects of Proposed Project on Sedimentation Regime

The Upper Penitencia Creek Watershed Statement/Report concluded that there were "no obvious erosion problem areas or critical sediment sources" in the upper watershed of Penitencia Creek. Ground cover and the riparian vegetation was seen to be in good condition. The average annual sediment load in the creek at Dorel Drive (located at the upstream end of the project), is about 52,000 tons. Approximately 34,000 tons of sediment is delivered to Coyote Creek each year by Upper Penitencia Creek, while the balance is deposited within the channel and on the floodplain. Erosion in Penitencia Creek downstream of Dorel Drive was found to be minimal.

Most erosion and sediment movement occur during high flow events. At present, flows less than 1000 cfs, which occur 99.9% of the time, will remain in the natural channel. Since Alternatives 1 and 2 do not involve any modifications to the natural channel, the sediment transport which occurs during flows

FIGURE 2



Santa Clara County, California
Guadalupe River and Coyote Creek
Hydrologic Engineering Office
Report
ONE-PERCENT CHANCE
FLOOD HYDROGRAPHS

JUL 1977

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of up to 1,000 cfs would be unaffected. Alternative 3, which involves excavating the natural channel, from Penitencia Creek Road to Mabury Road, to a trapezoidal cross-section, would affect sediment transport under all flow conditions. The most likely effect of Alternative 3 would be increased scouring in this section due to straightening and channelization. This could result in greater sediment loads to Coyote Creek, but as pointed out in the supplementary environmental documentation for the NRCS Final Environmental Impact Statement (FEIS), "... the effect on flow and sediment conditions within the creek, and on scouring flows in particular, is expected to be insignificant for the following reasons:

- There would be no effect more than 99.9 percent of the time.
- On an annual basis, less than 1 percent of the creek's total flow would be diverted into the bypass.
- Velocity reductions would generally be less than 10 percent during the brief periods when flow reductions do occur.
- The flow reductions would be limited to the reach between Capitol and Jackson Ave. and, to a lesser degree, the reach between Jackson Avenue and Mabury Road.
- Flows in the range of discharges that would be affected have minimal scouring capacity because of the backwater effects of obstructions. These backwater effects tend to become more pronounced as the flow approaches bankfull capacity.

Under present conditions, an estimated 18,000 tons of material is deposited in the channel or on the floodplain of Upper Penitencia Creek annually. Project conditions would restrict the floodplain considerably and the annual deposition of 18,000 tons of material would amount to about 0.2 feet of buildup in the natural and bypass channel sections, about 0.5 feet of build up in the excavated channel sections and about 0.05 feet of buildup across the modified floodplain sections. The above estimates of sedimentation depths assume a uniform distribution of material across the cross section, a specific weight of 120 pounds per cubic foot for the sediments and no significant change in the channel's existing sediment transport capacity.

When events exceed 1,000 cfs, all three of the alternatives are likely to affect the natural sediment transport and deposition process occurring in the creek, but past studies and documentation by the NRCS suggest that the significance of erosion and sedimentation resulting from proposed improvements to Upper Penitencia Creek's watershed would be small. However, to better identify potential sediment transport problems that may be associated with a proposed project, and to determine the need for

any sediment control structures, additional sediment studies are recommended in the feasibility phase. Work items would include: (1) field investigations and bed material sampling, (2) sediment production and delivery (sediment yield) estimates for average annual and single event storms, and (3) reach averaged sediment transport capacities for various flood magnitudes, i.e., perform a sediment continuity routing analysis.

E. Civil Design Assumptions

The design assumptions made by the NRCS for their 1990 report were reviewed by the San Francisco District and incorporated into the designs presented in this report. Geotechnical data obtained by the NRCS was reviewed to verify that the NRCS design assumptions were appropriate for a Reconnaissance level study. 17 soil borings taken along the banks of Upper Penitencia Creek from Coyote Creek to Dorel Drive indicated the following soil types for the following locations:

Location	Soil Type
Dorel Drive to Piedmont Road	clayey silts and silty gravels
Piedmont Road to Capitol Ave.	clayey silts and silty sands
Capitol Ave. to Jackson Ave.	clayey silts, silty sands, clay, and clayey sands
Jackson Ave. to Coyote Creek	clayey silts, silty sands, and silty gravel

The design slopes used in NRCS's 1990 report (5:1 channel slopes, 3:1 and 5:2 levee slopes) are reasonable assumptions for the soil types listed above. Further soil investigation for stability would be required during the Feasibility Study Phase.

3. ECONOMIC ANALYSIS

See Appendix A for a discussion of the economics, including considerations and assumptions, used during this study. Average annual benefits have been developed based upon a 100-year project lifetime.

4. ENVIRONMENTAL CONSIDERATIONS

Attached as Appendix B is the Environmental Assessment, as prepared by the San Francisco District. This assessment addresses the environmental impacts of Alternatives 1, 2 and 3.

Several candidate threatened or endangered species, including the California red-legged frog (a proposed endangered species), may occur within the study area. Upper Penitencia Creek also retains one of the only populations of steelhead trout in the South Bay region. The steelhead trout is currently under study by the National Marine Fisheries Service and could be listed at any time.

The 1990 study performed by NRCS found no known cultural resources in the creek corridor. However, field investigations are recommended to ensure that no undocumented resources exist in the area, particularly where bypass channels may be constructed.

Environmental impacts from Alternatives 1 and 2 would be minimal and would consist mainly of small losses of riparian forest which could be easily mitigated. However, Alternative 3 would result in more serious negative environmental impacts, including the loss of 10 or more acres of riparian forest. Furthermore, significant negative impacts on aquatic habitat and fish would likely result from the construction of the trapezoidal channel. Mitigation for impacts resulting from Alternative 3 are expected to be expensive and problematic due to an inadequate supply of suitable locations for on-site mitigation.

V PUBLIC INVOLVEMENT

1. GENERAL

This chapter briefly discusses the public involvement program during the study process. Throughout this study, the SCVWD and the Corps have cooperated closely on matters concerning the study. Extensive public involvement, as described below, occurred throughout the earlier NRCS study. It was agreed by the SCVWD and the Corps that further public meetings for this study would be repetitive and would not provide significant added value to the public or the study process. However, a Notice of Availability of the Environmental Assessment would be issued to the public, and a public meeting to discuss the results of the study would be held subject to a recommendation to continue into the Feasibility Study Phase.

2. PREVIOUS PUBLIC INVOLVEMENT EFFORTS

The sponsors and other local agencies have been working together to study the flood damage problems in the Upper Penitencia Creek watershed for over a decade. Public involvement has been incorporated into the studies throughout this process. Significant public coordination efforts carried out during earlier studies are summarized below:

January 1984 - February 1985: The NRCS and the sponsors developed a mailing list of local residents and property owners and organized a steering committee (composed of local volunteers) to advise the planning team on local needs and concerns.

November 29, 1984: Public Meeting.

January 22, 1987: The NRCS published a Notice of Intent to prepare an EIS in the Federal Register. The SCVWD mailed out over 4,000 letters to residents and property owners at this time to notify people that a plan was being developed and to solicit interest and concerns regarding the study.

1987: The steering committee (with local volunteers) met with the NRCS and the sponsors four times throughout the year.

May 2, 1987: A bus tour of the proposed project area was conducted for the public.

May 11, 1987: Public Meeting.

June 30, 1987: The sponsors, the NRCS, and agencies with an interest in the project met to discuss the project and walk the creek. Agencies included the California Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Corps of Engineers.

3. FISH AND WILDLIFE COORDINATION

The U.S. Fish and Wildlife Service (USFWS) provided their draft planning aid report to the San Francisco District on March 20, 1995. The draft report lists endangered and threatened species which may exist in the study area. Two species are known or expected to inhabit the project area. The San Joaquin kit fox *Vulpes macrotis mutica* (Endangered) may occur in the hills in the eastern extremes of the study area, but they are unlikely to exist in the project area due to insufficient habitat in this urban area. It is unknown whether the California red-legged frog *Rana aurora draytonii* (Proposed Endangered) inhabits the study area. Surveys would be proposed during the Feasibility phase of the planning process to determine the presence or absence of the frog, and to develop mitigation if necessary.

4. LOCAL SPONSORSHIP

The Santa Clara Valley Water District would act as the non-Federal sponsor for the Feasibility Study. A letter of intent to participate in the study appears in Appendix H.

VI PLAN FOR FEASIBILITY STUDY

1. GENERAL

This chapter summarizes the scope of the next phase of the planning process, the Feasibility Study. The tasks to be performed, the schedule, and the cost sharing agreement between the local sponsor and the Federal government are addressed below.

2. PUBLIC INVOLVEMENT

Close coordination with the local sponsor, the Santa Clara Valley Water District, would be maintained during the Feasibility study through their participation on the Study Team and the Executive Management Committee, both referenced in the Federal Cost Sharing Agreement (FCSA). In addition, a Public Scoping Meeting (F2) would be conducted to "kick off" the Feasibility Study.

3. SCOPE OF FEASIBILITY STUDY

During the Reconnaissance Study, a draft Project Study Plan (PSP) was prepared. This PSP itemizes the study tasks and the associated costs needed to conduct the Feasibility Study. The PSP addresses the efforts required to complete the detailed analysis of the alternatives. The specific details of this PSP are incorporated in the attached Feasibility Cost Sharing Agreement. The preliminary cost estimate for the Feasibility Study is $1,400,000. However, since the PSP has yet to be negotiated, this estimate is subject to change prior to the initiation of the Feasibility Study.

4. FEASIBILITY STUDY SCHEDULE

A Feasibility Study schedule was developed from the information provided in the PSP. The study milestones and major tasks are presented in the PSP, following the Appendices section of this report.

5. FEASIBILITY STUDY COST SHARING AGREEMENT

In order to proceed to the next study phase, a cost sharing agreement for the Feasibility Study must be signed between the Federal government and the non-Federal sponsor. In general terms, this agreement requires 50% local sponsor cost sharing of all the costs associated with conducting the Feasibility Study, half of which may take the form of in-kind services. The specific details of this agreement are attached following the Appendices section of this report.

VII RECOMMENDATIONS

1. GENERAL

This chapter presents preliminary conclusions regarding this Reconnaissance study.

2. STUDY CONCLUSIONS

Costs and benefits associated with each alternative are presented in Table III-10 in Chapter III of this report. All alternative plans are economically justified. The NED plan has not been designated at this point in the planning process. A summary of trade-offs associated with the System of Accounts appears in Table III-11.

Excluding the No-Action Alternative, Alternatives 1 and 2 would provide protection from the 100-year event while also satisfying the System of Accounts. However, Alternative 3 does not satisfy the Environmental Quality Account due to major adverse environmental impacts associated with it. In addition, the mitigation costs associated with Alternative 3 do not include the land costs required for mitigation planting. Therefore, the BCRs associated with Alternatives 3A, 3B, and 3C are artificially high. Thus, only Alternative plans 1A-1C and 2A-2C, meet the planning objective and also satisfy the System of Accounts.

3. RECOMMENDATION

Based upon the results of the Reconnaissance Study, Federal participation in the next study phase, the Feasibility Study, is recommended. This recommendation is made with the provision that prior to initiation of the Feasibility Study, the local sponsor will agree to and comply with the requirements of the Feasibility Study Cost Sharing Agreement (FCSA) attached to this report. The estimated Federal and non-Federal cost for this effort is presented in the attached FCSA.

Date

MICHAEL J. WALSH
LTC
Commander

APPENDIX A

ECONOMIC ANALYSIS OF STUDY AREA

ECONOMIC ANALYSIS for the Upper Penitencia Creek Flood Control Study Santa Clara County, California Reconnaissance Report

July 1995

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ECONOMIC EVALUATION OF PROJECT BENEFITS: UPPER PENITENCIA CREEK RECONNAISSANCE REPORT

July 1995

Section 1
Introduction

1.1 BACKGROUND: The Santa Clara Valley Water District (SCVWD) originally requested that the Soil Conservation Service(SCS) investigate the possibility of building a flood control project in the Upper Penitencia Creek Watershed. The SCS conducted a study and authored the 1990 report "The Upper Penitencia Creek Watershed". The "Upper Penitencia Creek Watershed" study found that a flood control project was justified (i.e. a benefit to cost ratio greater than one) and recommended that a project go to construction. However, the SCS was unable to begin building a project due to a congressionally mandated change in their mission.

The SCVWD subsequently requested that the Corps of Engineers re-examine the proposed project in order to determine if there was a Federal interest from the Corps criteria in constructing a flood control project in the Upper Penitencia Watershed.

After the release of the 1990 "Upper Penitencia Creek Watershed" report, the Soil Conservation Service's name was changed to the Natural Resource Conservation Service(NRCS). Consequently, all references to the "Upper Penitencia Creek Watershed" report in this economic appendix will cite the NRCS, as opposed to the SCS, as the authoring body of the "Upper Penitencia Creek Watershed" report.

1.2 PURPOSE AND SCOPE: The purpose of this economic assessment is to determine whether there is a Federal interest in constructing a flood control project on the Upper Penitencia Creek. This report presents a description of the methodology used to develop benefits used for benefit-cost ratios in order to establish economic justification. Benefits are expressed as average annual values at a Federal discount rate of 7 3/4 percent and a project life of 100 years.

1.3 DESCRIPTION OF STUDY AREA: The Upper Penitencia Creek is located in the northeast part of Santa Clara County, California, near the southern end of San Francisco Bay. The watershed lies in and adjacent to the eastern part of the city of San Jose and extends northward into the city of Milpitas. The total watershed area is approximately 24 square miles.

The watershed consists of two sections, the upper and the lower portions of the Upper Penitencia Creek. The upper watershed is above Dorel Drive, and contains an upstream portion of the Penitencia Creek and its principal tributary, the Arroyo Aguague. The lower Watershed is the primary area of interest as it is both a center of urban and economic activity, and vulnerable to

flooding. Most of the lower watershed was historically used for agricultural; particularly orchards, truck crops and cut flowers. This agricultural land use pattern has given way almost entirely to urban uses. Undeveloped land is now limited to a few scattered parcels still used for agriculture, and the corridor along Upper Penitencia Creek.

1.4 URBANIZATION AND GROWTH: The watershed is close to San Jose, which is a focal point for the electronics industry. Over the last 15 to 20 years the electronics industry has expanded at a rapid rate; along with this growth in the electronics industry there has been a corresponding surge of development in the area. This development has included light industry, apartment complexes and residential construction. Consequently, this area has become densely populated. The aforementioned population density has increased the area's exposure to significant financial losses in the event of severe flooding.

Section 2
Methodology

2.1 GENERAL: The reconnaissance level economic analysis uses the NRCS 1990 report, "The Upper Penitencia Creek Watershed", as a primary information source. The Corps economic analysis for the Upper Penitencia Creek reconnaissance report details the methodology used to derive the flood damage prevention benefits for the Upper Penitencia watershed. Also included are savings in the Administrative costs for the Flood Insurance Program (FIP). This evaluation utilizes the 1995 price level.

To estimate the flood damage reduction benefits, five major components needed to be determined: (1) the floodplain, (2) the depth of flooding, (3) the number of properties in the floodplain, (4) the value of property in the floodplain, and (5) the elevation of the damageable property within the floodplain. The economic analysis utilizes models and procedures developed by the Corps of Engineers, San Francisco District, supplemented by data from the 1990 NRCS report.

2.2 THE FLOODPLAIN: The economic analysis in this reconnaissance report utilizes the floodplains developed by the NRCS in the 1990 report "The Upper Penitencia Watershed" to estimate damages in the floodplain. In order to facilitate the estimation of damages, the NRCS divided the floodplain into 9 economic reaches (see Figure 1).

The hydraulic analysis used by the NRCS in the development of this floodplain varied somewhat from the analysis used by Nolte and Associates for the development of the floodplain of the same area for the Federal Emergency Management Agency (FEMA). The NRCS, in their hydraulic analysis, considered only Upper Penitencia Creek, Sierra Creek and Dutard Creek, while the FEMA floodplains also considered Crosby and Berryessa Creeks. Also, the analysis used by the NRCS to determine the peak flows for significant events, incorporated both 47 years of historical data and 19 years of gauge data. The FEMA peak flows for the Upper Penitencia Creek were developed using gauge data only. The differences between the NRCS and FEMA

hydrologic/hydraulic analysis are that the NRCS floodplain is less extensive than the FEMA floodplain and that the NRCS peak flows are higher than the FEMA peak flows.

The San Francisco District's Hydraulics/Hydrology (H&H) section reviewed the methods used by the NRCS to determine peak flood flows. Their review indicated that the NRCS flows appear to be based on sound engineering practice and are fully documented in the NRCS document, Upper Penitencia Hydrology, Book 1. Using gauge data taken on Upper Penitencia Creek, the San Francisco District's H&H section ran a flood frequency analysis using a logarithmic Pearson type III distribution for annual maximum streamflow (see Chapter IV, Section 2 of the main report for H&H details). This analysis determined that the NRCS discharges are higher than the FEMA results and lower than the Log Pearson III results. This indicates that the NRCS discharges are within an acceptable range, for a reconnaissance phase study.

2.3 FLOOD DEPTHS: The depth of flooding was developed by the NRCS for the 10-year, 25-year, 50-year, 100-year, and 500-year events under the present without project condition and for a future with project condition. The Upper Penitencia Creek hydraulics/hydrology developed by the NRCS was directly used to ascertain the depth of flooding within the floodplain and each of the 9 economic reaches. Each economic reach had a series of stations, and the NRCS calculated the depth of flooding at each station. The Corps then interpolated to determine the depth of flooding at any specific point and/or structure within a given area between two stations. In this way a distinct depth of flooding could be developed for individual structures. The advantage of this method is that it utilizes a structure by structure analysis for any given event.

The H&H section was consulted on the determination of present and future "zero-damage points". The "zero-damage point" is the discharge and the corresponding frequency at which damages in the floodplain begin. For this analysis a 5 year "zero-damage" point was used to describe the "without" project condition.

2.4 STRUCTURE INVENTORY: The Santa Clara Valley Water District (SCVWD) provided the Corps with a listing of all properties in the 100 year floodplain.

The SCVWD had originally participated in the NRCS study of the Upper Penitencia Creek Watershed and consequently had retained a copy of the original NRCS floodplains. The SCVWD then compiled a listing of properties within the 100 year floodplain as it was delineated by the NRCS. Consequently the SCVWD's listing was based entirely on the floodplain as it was delineated by the NRCS. This listing excluded properties not listed in the assessors roles (for example two elementary schools were not included in the inventory). Subsequently, the SCVWD submitted to the San Francisco District a current listing of properties in the NRCS 100 year floodplain by address and by Assessor Parcel Number. An inventory of the 100 year flood plain revealed a current population of over 4300 residential, commercial and industrial structures.

The total inventory was then refined into an economic reach by reach inventory. Structures in

the floodplain were categorized by land use type. The land use categories and descriptions are listed below.

- Single Family Residential (SFR)- detached one family homes (one story and two-story, both with and without basements) and mobile homes.

- Multi-Family Residential (MFR) - apartments, attached condominiums and townhouses (each MFR unit was counted as an individual structure)

- Commercial - offices, business parks, office/warehouses, retail outlets, motels

- Industrial - manufacturing plants, construction yards, warehouses

Economic reaches 1, 2, 4, 5, 6, 7, and 8 (see Figure 1) are predominately residential with a small percentage of commercial properties. Economic reach 3 is exclusively industrial and economic reach 9 is exclusively residential. See Table 1 for details.

TABLE 1
STRUCTURE INVENTORY

Economic Reach	Structure Inventory	Residential Properties	Industrial Properties	Commercial Properties
1	1080	1035	0	45
2	675	653	0	22
3	119	0	119	0
4	611	587	0	24
5	894	853	0	41
6	287	286	0	1
7	371	358	0	13
8	105	97	0	8
9	220	220	0	0

2.5 IMPROVEMENT VALUES AND STRUCTURE ELEVATIONS: A randomly selected sample of 81 properties, based on the above inventory, formed the data base for this analysis. Using the Assessor's records, which were superimposed on the 100 year floodplain, it was possible to select properties by Book, Page, and Parcel number.

Structure values used in this report are based on the replacement value less depreciation. These values were determined through use of the 1994-1995 Santa Clara County Assessors Rolls for property identification and initial valuation. The value of the improvements only (i.e. land is

excluded) are listed in the Assessor Roles. Utilizing the Marshall & Swift Valuation Service, these assessed values were then adjusted to reflect current replacement value less depreciation by netting out the effects of "Proposition 13", which limits annual increases in assessed value to two percent.

The Improvement values were then used as input for the damage estimation program(see section 3.2 for details of the damage estimation program). The overall estimated value of improvements subject to flooding is approximately $1,055,000,000 (67% residential, 10% commercial and 23% industrial). See Table 2 for details.

TABLE 2

FLOODPLAIN PROPERTY VALUES
(rounded)

	Value	Percent of Total
Residential	$708,400,000	67 %
Commercial	$102,900,000	10 %
Industrial	$244,000,000	23 %
Total	**$1,055,000,000**	

The Corps, via a contract issued to Jack Faucett and Associates, physically inspected the sampled properties. The elevations at ground level and at the first floor were noted for each of the structures in the sample. The elevations were measured in the field using a level and a rod, and the first floor elevations were then used as input for the damage estimation program.

2.6 VALUE OF CONTENTS: The value of a structure's "contents" was not independently determined. Instead, typical ratios of content value to structure value were applied by land use and structure type as follows:

50 percent for residential
100 percent for commercial
200 percent for warehouses
100 percent for industrial

Overall, these ratios represent the best available information to apply to the various types of residential and non-residential properties.

Benefit Calculations

3.1 BENEFITS SUMMARY: The economic benefits for the Upper Penitencia Creek flood control project will be due primarily to a reduction in damages caused by recurring flood events. The majority of the benefits will accrue from a reduction in structural damages to residential, commercial and industrial structures, combined with the reduction in damages to their respective contents. The remainder of the economic benefits will result from a reduction in damages to automobiles in the floodplain, and the savings in future Flood Insurance Administration (FIA) costs.

The average annual flood damage reduction benefits evaluated in all categories total an estimated $5,200,000. However, in any densely populated floodplain such as that of Upper Penitencia Creek, a major flood would also cause other types of damages that were not evaluated in this study. Unevaluated damages might include structural damage to utilities, roads, public structures not listed in the assessors roles and bridges; revenues lost by businesses in the commercial and industrial areas; and wages lost by the employees of these businesses. Table 3 summarizes the benefits calculated at the 1995 price level.

TABLE 3
AVERAGE ANNUAL FLOOD PREVENTION BENEFITS:
SUMMARY
(Rounded)

Buildings and Contents	$4,697,000
Automobile Damage	$273,000
Subtotal	$4,970,000
Flood Insurance Administration Costs	$230,000
Total	**$5,200,000**

3.2 INUNDATION REDUCTION BENEFITS FOR PROPERTY: The NRCS floodplain was divided into 9 economic reaches. Each reach was surveyed and a sample of its structure population was taken. The damage to property (structure, contents, and automobiles) was derived based on a damage estimation program written in Lotus 1-2-3, release 5, (Developed by USACE, San Francisco). The flood damages are estimated by combining economic inventory data, the field work data, and the hydrologic data. These data were inputted into the Lotus 1-2-3(R5) computer program.

In order to estimate damages in the floodplain, the economic value data, together with the depth-damage relationships, were arrayed with the hydrologic data (the depths of flooding). Essentially, the program derives damages in the floodplain by looking at the water surface elevation associated with a particular flood event and comparing it to the elevation of various structures in the floodplain. It then looks at the depth of flooding and matches the level of

flooding to a depth damage curve that is appropriate to the structure being measured. Damages are then calculated by linking the depth damage curves to the specific structures and their values, and then compiling the total damages for a flood event. The calculations considered the type of structure, the value of the structure, the value of the contents, and the depths of flooding associated with each of the various flood events evaluated (the 10-, 25-, 50-,100-, and 500- year events).

Table 4 shows the estimated structure and content damages for floods with different recurrence intervals. These are the projected damages for the "without" project condition. These figures are based on present land use conditions in both the upper and lower watershed. The SCVWD does not anticipate any future changes that will significantly affect the volume or rate of runoff and therefore the projected damages.

TABLE 4
FLOOD DAMAGE TO PROPERTY:
"WITHOUT" PROJECT CONDITION
(Rounded)

Flood Event Recurrence Interval	10 Yr 0.1	25 Yr 0.04	50 Yr 0.02	100 Yr 0.01	500 YR 0.002
Residential	9,225,000	17,075,000	54,100,000	96,200,000	130,275,000
Commercial	2,700,000	2,850,000	5,450,000	7,000,000	11,425,000
Industrial	2,350,000	2,800,000	3,150,000	6,950,000	10,175,000
Automobiles	700,000	1,350,000	4,475,000	1,375,000	16,775,000
Damages per Event	15,000,000	24,050,000	67,175,000	121,525,000	168,650,000
Number of Structures With Flooding above The First Floor	120	319	1445	1900	2344
Number of Structures Surrounded by Water	3179	3270	3548	3751	764

Similarly for autos, the average local auto value (currently estimated to be $7,500), estimated

number of autos anticipated to be at the site, and their relative elevation at each sampled location were inputted into the program. The car depth-damage schedule used in this evaluation was developed by the SCS (which later changed its name to the NRCS) for the Lower Silver Creek. The Lower Silver Creek is in the same general area as the Upper Penitencia Creek and the depth-damage curve developed for that study was felt to be appropriate for this Reconnaissance study. the Depth-damage curve was formulated based on car-damage interviews with individuals and insurance companies in Northern California.

As a general rule, no significant evacuation of the cars could be anticipated because of the relatively large number of cars compared to the restricted and potentially flooded egress. The unpredictability of an actual flood event also makes an early evacuation warning unlikely. The damage to automobiles are also detailed in Table 4.

Standard depth damage curves were used to project the damages to residential, commercial and industrial structures and contents. These structure and content depth damage curves are the result of empirical studies by the Corps -San Francisco District- and are considered to be appropriate for the area.

During a 100-year event approximately 1,850 acres will be inundated with up to 5 feet of water. In general, depths will average 2 to 3 feet, but as the water accumulates in the Milpitas area depths will approach 5 feet. Over 4,300 residential, commercial, and industrial structures will be surrounded or isolated by water in their yards or in the adjacent streets. Over 1,900 of them will have water entering their first floors. Damage to automobiles, buildings and their contents are estimated to be approximately $121,500,000 for the 100-year event. Table 4 shows damage estimates for 5 individual floods with different magnitudes and return periods for the "without" project condition. Average annual damages, including residual damages, were then calculated by using standard damage-frequency integration techniques. The procedure utilizes "quadrant curves" in which the damages, frequency (recurrence interval), and discharge are arrayed on separate axes and the lower right quadrant is integrated to determine average annual damages (see Figure 2). Average annual damages to property are calculated as well as average annual residual damages (see Table 5).

TABLE 5
DAMAGES AND BENEFITS
(Structures, Contents and Automobiles)

Average Annual Damages	$5,230,000
Residual Damages(100 Year Protection)	$260,000
Average Annual Inundation Reduction Benefit to Property	$4,970,000

The average annual inundation reduction benefits to property ($4,970,000) are derived by subtracting the residual damages from the overall damages.

3.3 SAVINGS IN FLOOD ADMINISTRATION COSTS. These costs are regarded as NED costs and the elimination of flooding would provide NED benefits. The Federal Flood Insurance Program is administered by the Federal Emergency Management Agency (FEMA), which provides insurance against flood damages for residents of recognized flood prone areas. There is a national cost associated with the administration of the flood insurance program. The cost of servicing flood insurance policies in effect at the time of the study is the average cost per policy, including agent commission, and the cost of servicing and claims adjusting. According to the most recent Economic Guidance Memorandum 95-4, the cost is $115 dollars per policy. There are approximately 4000 structures in the 100 year floodplain. Because the level of flood protection envisioned by this study removes the threat of flooding, up to and including the 100 year event, the at risk structures in the floodplain would not require FIA insurance. This would create an annual savings in administrative costs. It is estimated that 50 percent of the buildings would actually have policies and therefore contribute to the annul policy savings. If only 50 percent of the buildings in the floodplain had policies then the annual savings would be

[1/2(4000 buildings*$115 policy)] = $230,000 at the 1995 price level.

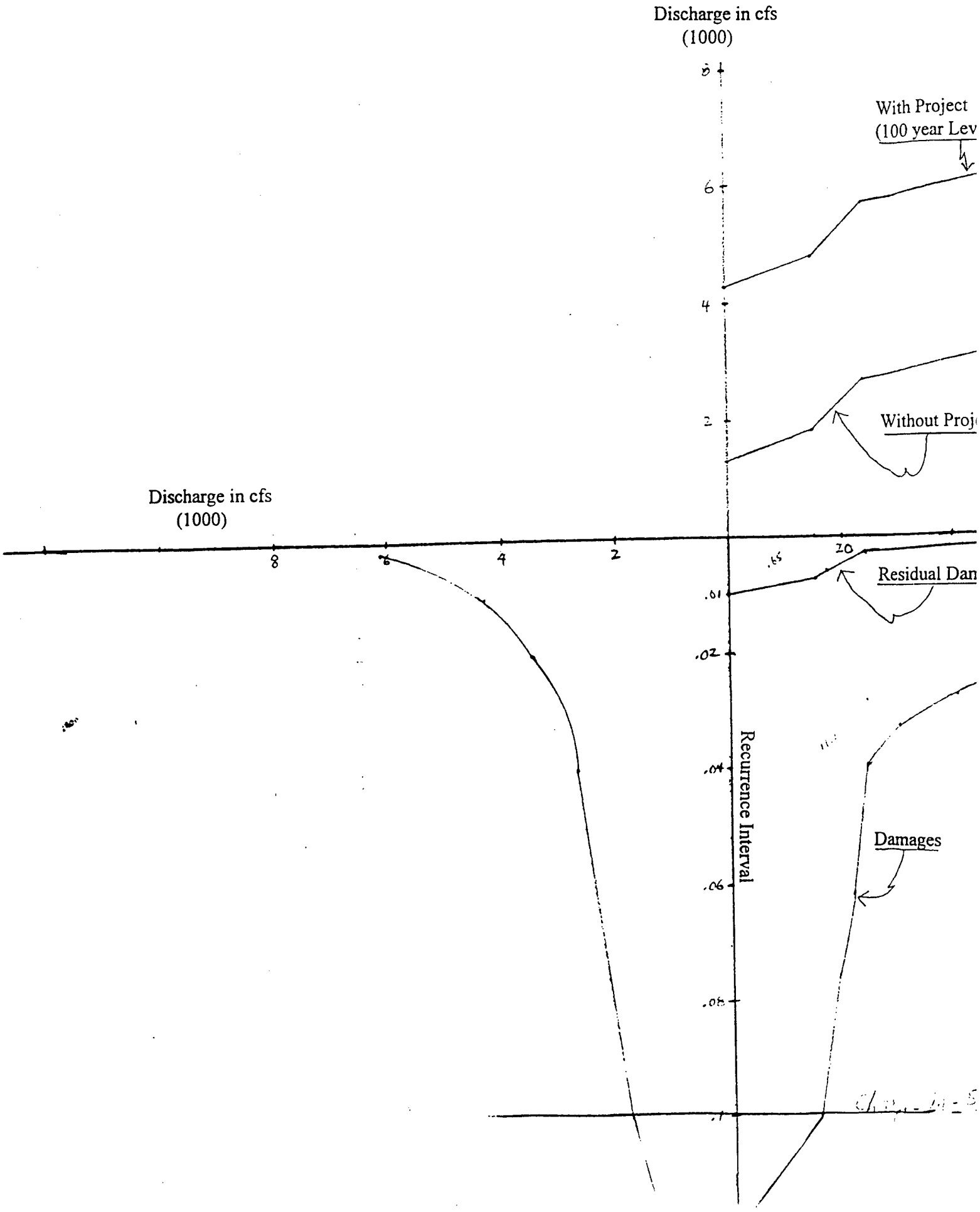
References

Jack Faucett Associates. 1995. Upper Penitencia Creek Flood Control Study. Unpublished report prepared for San Francisco District.

Marshal Swift Valuation Service. 1995. Residential Cost Handbook.

Soil Conservation Service. 1990. Upper Penitencia Creek Watershed: Final Watershed Plan and Environmental Impact Statement\Report.

Figure 1
Index Map of Economic Reaches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Recurrence Interval
Damages

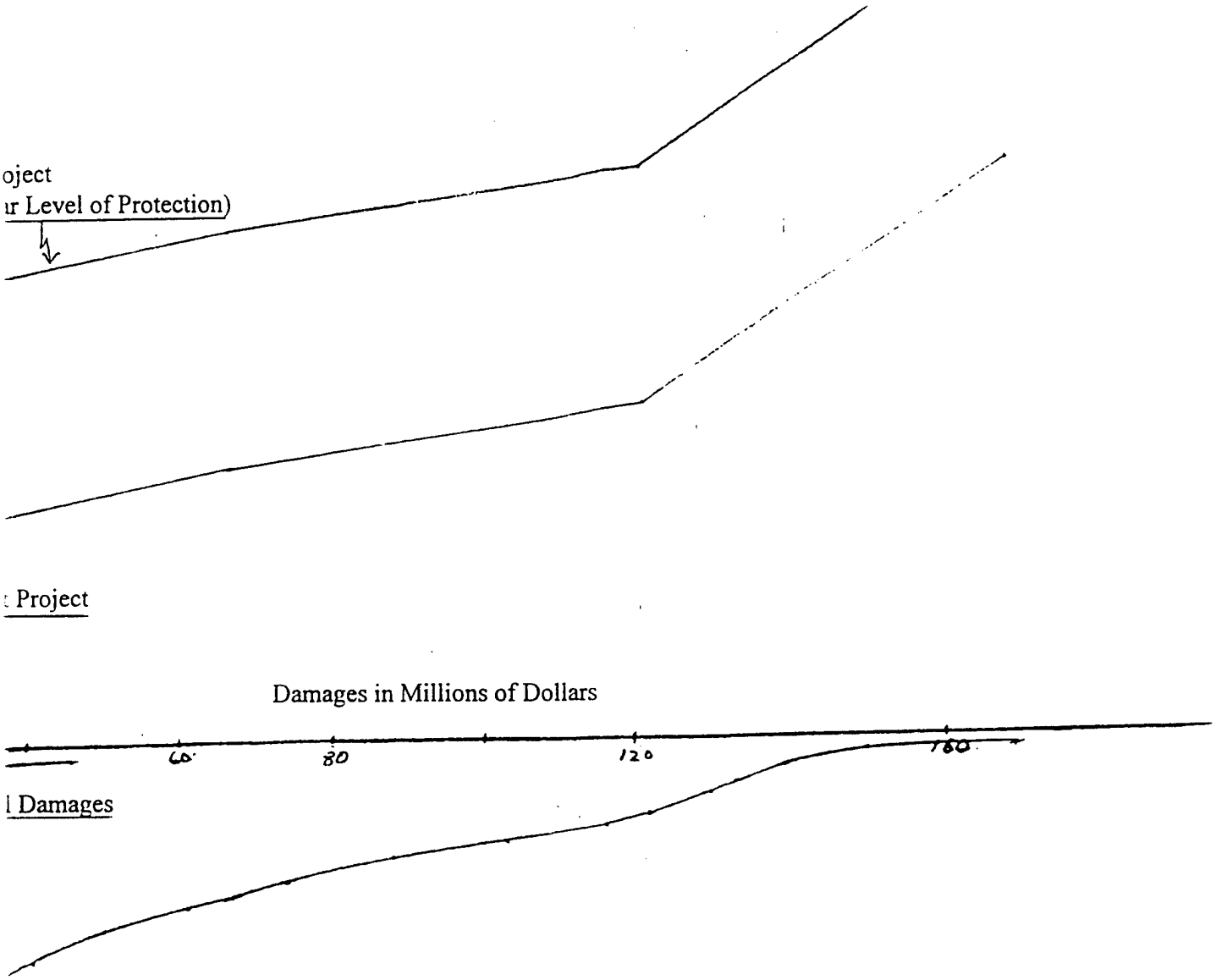


Figure 2

Upper Penitencia Creek Damages and Benefits
(Structures, contents and Automobiles)

Average Annual Damages	$5,230,000
Residual Damages(100 Year Protection)	$260,000
Average Annual Innundation Reduction Benefit to Property	$4,970,000

APPENDIX B

ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL ASSESSMENT

FOR THE

UPPER PENITENCIA CREEK
FLOOD CONTROL
RECONNAISSANCE STUDY
SANTA CLARA COUNTY, CALIFORNIA

JULY 1995

PURPOSE

The Corps of Engineers, San Francisco District has initiated a reconnaissance study of flooding problems along Upper Penitencia Creek, Santa Clara County, California. Presently, there are 1,500 buildings in the floodplain susceptible to flood damage during a 100-year flood event. This assessment describes the area under study, alternatives considered for flood damage reduction, their impacts and required mitigation.

STUDY AUTHORITY

Flood Control Act. The Upper Penitencia Creek Flood Control Reconnaissance Study was prepared under the authority of the Flood Control Act of 1941, which authorizes a preliminary examination and survey of the Coyote River, its tributaries, and adjacent streams. Section 4 of this Act states that, "The Secretary of War is hereby authorized and directed to cause preliminary examinations and surveys for flood control, to be made under the direction of the Chief of Engineers, in drainage areas, the United States and its territorial possessions, which include the following named localities: Coyote River and tributaries, California; San Francisquito Creek, San Mateo and Santa Clara Counties, California; Matadero Creek, Santa Clara County, California; and, Guadalupe River and tributaries, California."

This study of Upper Penitencia Creek is authorized by Section 4 since it is a tributary of Coyote Creek (Coyote River).

National Environmental Policy Act. Section 102(c) states that, "The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible federal official on the environmental impact of the proposed action, any adverse effects which cannot be avoided should the action be implemented, alternatives to the proposed action, the relationship between the local short-term use of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Therefore, an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) or an Environmental Impact Statement (EIS) will be prepared.

PROJECT DESCRIPTION

Upper Penitencia Creek within the study area is divided into seven reaches, totaling 3.77 miles, as follows:

Reach One: Dorel Drive to Noble Avenue (0.36 miles)
Reach Two: Noble Avenue to Piedmont Road (0.53 miles)
Reach Three: Piedmont Road to Penitencia Creek Road/Creek Crossing (0.44 miles)
Reach Four: Penitencia Creek Road/Creek Crossing to Capitol Avenue (0.57 miles)
Reach Five: Capitol Avenue to Jackson Avenue (0.51 miles)
Reach Six: Jackson Avenue to King Road (0.92 miles)
Reach Seven: King Road to Coyote Creek (0.44 miles)

ENVIRONMENTAL SETTING

Physical Environment. Upper Penitencia Creek drains a 15,300 acre (24 mi^2) area in the eastern portion of the Santa Clara Valley and adjacent portions of the Diablo Range. The entire watershed lies within Santa Clara County, and the western portion also lies within the city of San Jose. The floodplain includes the western portion of the watershed within San Jose, and extends north beyond the watershed boundary into the city of Milpitas. Upper Penitencia Creek empties into Coyote Creek, which drains the entire eastern side of the Santa Clara Valley and empties into the San Francisco Bay east of Alviso.

The topography in the eastern portion of the Upper Penitencia Creek watershed is mountainous, with sharp relief and many steep slopes. The western portion of the watershed consists of an alluvial apron that gently slopes from the foothills of the Diablo Range down to the center of the Santa Clara Valley. Elevations within the watershed range from approximately 55 feet above sea level at the junction of Coyote and Upper Penitencia Creeks to nearly 3000 feet above sea level in the Diablo Range. The northern portion of the floodplain (in northwestern Milpitas) extends downward to elevations near sea level.

Biological Environment. The upper portion of the watershed is covered with vegetation typical of the Inner Coast Ranges, predominantly valley grassland and foothill woodland, with riparian forest along canyon bottoms and mixed evergreen forest on some north-facing slopes. The upper watershed remains fairly natural with its ecological functions largely intact.

The lower portion of the watershed formerly was covered with valley grassland and valley oak woodland, with riparian forests along the creek. Subsequent conversion of the landscape to orchards resulted in loss of nearly all of these natural habitats. The orchards have since nearly all been replaced with urban development. Riparian forests along the creek have been removed or degraded in many locations, but most of the length of Upper Penitencia Creek within the lower watershed still has considerable riparian vegetation.

Three types of terrestrial vegetation occupy the study area. Riparian forest occurs on streambanks along most of the length of the creek within the study area, although it forms a rather sparse cover in some areas. This vegetation type provides the best terrestrial wildlife habitat within the study area. Ruderal vegetation occupies open space areas adjacent to some portions of the creek. This vegetation type has moderately low value as wildlife habitat. Finally, urban vegetation (landscaping) occupies most lands in the study area that are not covered with pavement or buildings. This vegetation type has very low wildlife habitat value except for certain species of birds that are adapted to this environment.

Upper Penitencia Creek and its associated riparian forests provide a migration corridor for wildlife, connecting the riparian forests of Coyote Creek with the wildlands of the Diablo Range. While this corridor is degraded, it is the only migration corridor that can serve this function in this area. Loss or fragmentation of this corridor could have negative impacts on the ecological health of the riparian corridor along Coyote Creek. Conversely, this corridor's value for wildlife migration could be considerably enhanced if the continuity and quality of the riparian forest were improved.

The watershed provides good habitat for wildlife. The percolation ponds are frequented by ducks and shorebirds. The riparian corridor provides cover for many mammals like black-tailed deers, squirrels, racoons, mice, bats, and opossums. Other known species that occur in the area include garter snakes, western fence lizards, western toads, and Pacific tree frogs.

Aquatic Environment. Upper Penitencia Creek has surprisingly good aquatic habitat considering its urban location. The combination of perennial flows in the upper portion of the creek, a relatively unmodified stream course, and generally good aquatic shade along most of the creek's length result in the creek retaining a reproducing population of steelhead trout *Oncorhynchus mykiss*, a rarity in the South Bay. This candidate species spawns in cold freshwater streams, but like the salmon, it spends most of its adult life in the ocean. However, existing water diversions by the Santa Clara Valley Water District leave the lower portion of the creek dry much of the year, considerably lessening aquatic habitat values in these reaches and interfering with migration of this species. The National Marine Fisheries Service (NMFS) is

currently conducting status reviews for the steelhead trout pursuant to the Federal Endangered Species Act.

Upper Penitencia Creek supports large expanses of Shaded Riverine Aquatic Cover (SRA). The SRA provides shade that reduces water temperature favorable to salmonid spawning, while providing cover for birds, mammals, amphibians and reptiles that utilize the creek for food and cover. It also promotes the establishment of invertebrates that are in turn utilized by fish and birds as a food source.

The Santa Clara Valley Water District (SCVWD) uses percolation ponds adjacent to the creek and the bed of the creek itself as ground water recharge areas. The primary water source for the ponds is the South Bay Aqueduct of the State Water Project. Most of the recharge ponds are located next to the creek in Reach 2. There is one pond by the south bank near Mabury Road. Water is introduced through a pipeline and diverted from the creek into the percolation ponds in Reach 2, thereby degrading downstream habitat. However, any excess water diverted into the ponds spills back into the creek. The SCVWD does release water from the percolation ponds back into the creek for recharging purposes and also uses it to transport water from the ponds in Reach 2 to the one by Mabury Road.

Socioeconomic Environment. The watershed and floodplain of Upper Penitencia Creek encompass a diversity of land uses and socioeconomic groups. The upper portion of the Upper Penitencia Creek watershed is a sparsely-populated area, with inhabitants consisting of ranchers and a few former urbanites with country homes. The remainder of the watershed is heavily urbanized. Between Alum Rock Park and Mabury Road, the landscape is nearly all residential. Downstream to the mouth of the creek and northward in the floodplain, light industry becomes a major land use component. Neighborhoods east of Interstate 680 are mainly middle-class and are predominantly white. West of the interstate, neighborhoods consist of lower economic classes and a higher percentage of minorities. The economy of the Santa Clara Valley is dominated by the electronics industry and other types of light industry.

Cultural Resources. A 1990 study by the Soil Conservation Service found no known cultural resources in the creek corridor. However, given the favorable environment for prehistoric habitation, undocumented resources may exist in the area.

Hazardous, Toxic, and Radioactive Waste (HTRW): The Santa Clara Valley Water District (SCVWD), The County of Santa Clara Department of Environmental Health (SCDEH), and The United States Environmental Protection Agency (USEPA) were contacted during this reconnaissance study to identify any known existing HTRW sites that might be affected by construction of this project.

HTRW includes any materials listed as a "hazardous substance" under the Comprehensive Environmental Response, Compensation and Liability Act, 42 USC 9601 et seq (CERCLA). Hazardous substances regulated under CERCLA include "hazardous wastes" as identified under the Resource Conservation and Recovery Act (Sec 3001, 42 USC 6921), Clean Air Act (Sec 311, 33 USC 1321 and Sec 112, 42 USC 7412), Clean Water Act (Sec 307, 33 USC 1317), and the Toxic Substances Control Act (Sec 7, 15 USC 2606). These do not include petroleum or natural gas unless included in the above categories (42 USC 9601(14)).

Of six sites identified (Table 2, Page 15) as potential HTRW sites, five are within one mile southwest of the lower reaches of Upper Penitencia Creek at the Mabury Road crossing, and the other is about one mile northwest of the confluence of Coyote and Upper Penitencia Creek. Solvent Service, Incorporated, located one-third mile southwest of the confluence is the only site that is designated as an EPA's Superfund Site.

Since any work in the lower-reaches of Upper Penitencia Creek are to be done on the right bank downstream side of the Creek (northern bank) and based on preliminary findings and studies of existing documents, this project will not disturb known HTRW sites.

PROPOSED ALTERNATIVES

Alternative 1. *Downstream Bypass and Upstream Modified Floodplain.* This alternative would utilize a combination of floodwalls and levees from the upstream end of the floodplain downstream to Capitol Avenue (Reaches Two to Four). A rock-lined bypass channel would be constructed from Capitol Avenue downstream to King Road (Reaches Five to Six), and a concrete bypass from that point downstream to Coyote Creek (Reach Seven). The entire length of the existing Upper Penitencia Creek channel would remain unchanged except for small areas where the bypass channel would enter or leave the natural channel.

Alternative 2. *Downstream Partial Bypass and Upstream Modified Floodplain.* This alternative resembles the preceding one, except that the bypass would begin 1,800 feet downstream from Jackson Avenue (mid-Reach Six), with all reaches above Jackson Avenue receiving flood protection from levees and floodwalls.

Alternative 3. *Downstream Partial Bypass and Partial Trapezoidal Channel, and Upstream Modified Floodplain.* This alternative resembles the second alternative except that a rock-lined trapezoidal channel would replace the natural channel between the Penitencia Creek Bridge and a point 1,800 feet downstream from Jackson Street (Reach Four to mid-Reach Six).

No Action Alternative. If no action were taken by either the Federal Government or local interests to alleviate the flooding problem along Upper Penitencia Creek, repeated flooding would continue. This plan would result in continued average annual flood damages in excess of $5 million in the San Jose/Milpitas area of the watershed.

ENVIRONMENTAL IMPACTS FOR PROPOSED ALTERNATIVES

Physical Environment. All the alternatives would provide a 100-year level of flood protection. Since floods up to the 100-year level would remain confined rather than spreading over all or much of the floodplain, the hydrologic and sediment characteristics of Upper Penitencia Creek in the project reaches (and Coyote Creek downstream of its confluence with the bypass) would

be altered during flood events. However, no significant impacts on water quality or quantity are expected. Although some temporary noise and air pollution impacts are unavoidable, others may be reduced or mitigated depending on the equipment and other potential technologies or management practices utilized.

Biological Environment. Alternatives 1 and 2 would have minimal biological impacts. Small losses of riparian forest may occur at the intake and outfall points for the bypass and at road crossings. (A flood control proposal similar to Alternative 1, proposed by the Soil Conservation Service in 1990, would have caused the loss of 1.7 acres of riparian vegetation.) These small losses would be easily mitigated. Construction of the bypass and floodwalls would cause the loss of some low-value ruderal habitat. This loss would not be significant and would require no mitigation. In addition, at locations where floodwalls would be constructed adjacent to existing trees, some roots would be severed as trenches are dug for floodwall stability. This impact would not be significant.

Under Alternative 2, there would not be channel excavation at the Capitol Avenue and Interstate 680 bridges. This amounts to a 29% decrease (0.5 acres) in impacts to riparian vegetation relative to Alternative 1.

Aquatic habitat would probably not be significantly affected under these two alternatives, although care would need to be taken to ensure this outcome. Any loss of shaded riparian aquatic (SRA) cover should be fully mitigated through plantings of riparian vegetation along currently barren streambanks.

Coordination with federal and state resource agencies would be needed to ensure that the bypass would not have adverse impacts on migrating steelhead trout. Potential impacts on the red-legged frog and other species of concern need to be evaluated in detail. A Biological Assessment (BA) would be necessary in order to evaluate potential impacts on these species.

Alternative 3 would have similar effects on terrestrial ecosystems outside of the channelized reach as the other two alternatives. However, within the channelized reach it would have serious

negative impacts on riparian forest, with significant losses of this regionally scarce vegetation type. Channelization would result in the loss of 8,000 feet of streambank vegetation (about 10 acres) on both sides of the creek. Impacts on aquatic habitat and fish would be even more significant because the SRA cover contains overhanging vegetation that reduces water temperature, provides escape cover, and increases the propagation of aquatic insects. There would be losses of riffle and pool habitats throughout this reach. Riffles and pools are essential for fish as they channel food, provide escape cover from predators, and allow for instream habitat diversity. Channelization would essentially cause sheet flows through the channel, thus creating potential barriers to upstream and downstream migration during low flow conditions. The trapezoidal channel could be a significant barrier to steelhead trout migration; losses of stream side shade and holding areas for adults (as well as possible holding areas for young fish) would also have significant negative impacts.

Mitigation of riparian forest losses under this alternative would be possible but expensive, with costs, exclusive of land, exceeding $675,000. There is insufficient suitable acreage on-site for riparian forest mitigation. Full on-site mitigation of aquatic habitat losses would be difficult under this alternative; mitigation costs cannot be estimated at this time, but would probably be very high.

Impacts to the wildlife environment of all three alternatives will occur as a result of vegetation removal. Small mammals, reptiles, and amphibians would be destroyed. Birds would lose nesting sites. Habitat losses would be permanent within the creek resulting in a net overall loss of wildlife habitat. Under Alternative 3, impacts would be much higher since a major portion of the riparian corridor would be lost.

Socioeconomic Environment. All three alternatives would generally have similar impacts on the socioeconomic environment. The primary impact would be a major reduction in flood damages (primarily damages to structures and their contents, automobiles, and public facilities such as roads) within developed portions of the floodplain. All three alternatives would also create temporary construction jobs, and subsequent temporary and localized positive economic impacts.

All three alternatives would have noticeable aesthetic impacts. The aesthetic impacts of levees and bypass channels would be fairly minor. The rock lining of the bypass channels would cause permanent minor visual impacts. However, over time these linings should be covered with dirt and ruderal vegetation, as a result from floods on the creek. The floodwalls would have larger visual impacts due to their more angular and abrupt form. In addition, standard concrete is grayish white, so floodwalls made of this material could create an objectionable visual impact, especially for homeowners who would have floodwalls across the street from their homes. This impact could be mitigated by using concrete colored an appropriate earth tone. However, regardless of the color of the concrete, graffiti on the floodwalls could become an aesthetic problem.

The trapezoidal channel proposed in Alternative 3 would have strong visual impacts due to the permanent removal of up to 8,000 linear feet of riparian vegetation. This visual impact could be largely mitigated through planting of trees outside of the new channel, although the end result would still not be as visually appealing at close range as the present stream environment. It is important to note that such plantings would not provide adequate mitigation for loss or degradation of riparian and aquatic habitats.

Cultural Resources. All three alternatives have the potential to disturb currently undocumented prehistoric cultural resources. Alternatives 1 and 3 have a greater chance of disturbing such resources given the greater amount of excavation that would be required under these alternatives. Thorough field investigations (including auguring) should be conducted during the feasibility phase, especially in locations where bypass channels are being considered.

Water Quality: Since construction would occur in the summer, when the creek is dry, impacts to the water quality would be insignificant.

THREATENED AND ENDANGERED SPECIES

Planning Aid Report: The United States Fish and Wildlife Service (FWS) has consultation responsibility over the federally-listed species and has provided a Draft Planning Aid Report

with recommendations that would provide for conservation of fish and wildlife resources. Their recommendations may be modified as more project information becomes available, and following more formal coordination with other regulatory agencies, which may review that report.

Species List: A list of endangered and threatened species for the project was prepared by the United States Fish and Wildlife Service (FWS) on December 22, 1994, and submitted to the Corps. On July 8, 1995, FWS was contacted and it was concluded there were no additional species to be added. However, the status of a few plants had changed and has been incorporated in the discussions below on federally-listed species that may be found within the project area.

Endangered: The tidewater goby *Euclyclogobius newberryi* is a native Californian species that inhabits semi-closed estuaries or lagoons of small coastal streams. It grows no greater than 5 cm (2 in) and prefers streams with low salinity levels. The decline of the tidewater goby is mainly due to habitat loss resulting from the manipulation of these coastal streams by man (McGinnis 1984). The tidewater goby is not known or expected in the project area.

The San Joaquin kit fox *Vulpes macrotis mutica*, smallest of the fox species, inhabits arid regions of western North America. They live in grassland and open scrub habitats. The kit fox is generally nocturnal, spending most of the daylight hours in elaborately constructed dens. Burrows can be as long as six to fifteen feet, consisting of numerous tunnels and chambers that are dug in light sandy loam soils in areas of gentle slopes. During the summer, an individual fox may use as many as four or more dens each month to avoid fleas. Home ranges overlap and are usually not greater than 1-2 square miles. During the breeding season, adults and pups occupy more complex dens which belong to specific family groups and are probably constructed over many years. For this project the fox may occur in the hills east of the study area but is not expected within the study area due to the degraded habitat and proximity to human settlement and development, as well as the generally heavy soil texture.

The robust spineflower *Chorizanthe robusta* is endemic to sandy soils of coastal habitats in southern Santa Cruz and northern Monterey Counties. Coastal dune and coastal scrub

communities are present in the county, but not within the study area. Additionally, the spineflower has been extirpated from Santa Clara County, so it is not expected in the study area.

The Santa Clara Valley dudleya *Dudleya setchellii* is a low-growing perennial of the stone crop family with fleshy, glabrous leaves. It is restricted to rocky outcrops within serpentine grassland in Santa Clara County. It is found only in the Coyote Valley area, from San Jose south about 20 miles to San Martin, at elevations of 300 to 900 feet. The study area is not within a serpentine grassland area, so this species is not expected in the area.

The Metcalf Canyon jewelflower *Streptanthus albidus ssp. albidus* is an annual herb of the mustard family *Brassicaceae* that reaches up to 3 feet in height. It is endemic to serpentine outcrops with little soil development. It can be locally abundant but its range is limited, extending less than 30 miles for San Jose south to Anderson Lake (McCarten 1992). The plant is threatened by urbanization and off-road vehicles. The jewelflower is found only in serpentine outcrops that are not within the project site.

Proposed Endangered: Contra Costa goldfields *Lasthenia conjugens* has been extirpated in Santa Clara County. Therefore, there will be no impacts to the plant from this project.

The California red-legged frog *Rana aurora draytonii* is a highly aquatic frog which occurs in the vicinity of quiet, permanent pools of streams, marshes, and occasionally ponds. Adults eat aquatic and terrestrial insects, crustaceans, snails, worms, fish, tadpoles, and smaller frogs. Aquatic larvae are mostly herbivorous. Loss of habitat and the introduction of exotic predators are a concern (Zeiner et al. 1990). It is presently not known whether the red-legged frog inhabits the study area. Further studies are needed to determine whether it would be affected by the project.

Candidate Species: Pacific western big-eared bat *Plecotus townsendii townsendii* and the greater western mastiff bat *Eumops perotis californicus* prefer to roost in building crevices, trees, and caves and have a wide habitat range. It is possible that these bats may inhabit the study area. The California tiger salamander *Ambystoma californiense* prefers permanent ponds and streams.

It is possible that the salamander may inhabit the percolation ponds within the study area. The riparian brush rabbit *Sylvilagus bachmani riparius* and the San Francisco dusky-footed woodrat *Neotoma fuscipes annectens* favor dense brush and it is possible that they both may have suitable habitat in the project study area. South Bay clarkia *Clarkia concinna ssp. automixa* occurs in woodland habitat in the Mt. Hamilton Range and may occur in the study area. Longfin smelt *Spirinchus thaleichthys* is not known from this area. The Northwestern pond turtle *Clemmys marmorata marmorata* has no suitable nesting or basking sites in the study area. Alkali milk vetch *Astragalus tener var. tener,* Valley spearscale *Atriplex joaquiniana* has been extirpated in Santa Clara County. Mt. Hamilton thistle *Cirsium fontinale var. campylon* only grows on serpentinite seeps in the Mt. Hamilton Range and suitable habitat does not exist in the study area. Northcoast bird's beak *Cordylanthus martimus var. hooveri* and Hoover's button celery *Eryngium aristulatum var. hooveri* do not occur within the study area. Pappose spikeweed *Hemizonia parryi ssp. condonii* no longer occurs within the project study area. The Delta tule pea *Lathyrus jepsonii var. jepsonii* grows in brackish and freshwater marshes and is not expected to be found in the study area.

MITIGATION REQUIREMENTS

Losses of riparian vegetation and SRA cover removed by construction would be mitigated through plantings of riparian forests along currently barren stream banks. The impacts for Alternatives 1 and 2 would be modest and easily mitigated to insignificance. Under Alternative 3, mitigation for habitat loss would be more difficult and expensive. There is not enough mitigation land along the creek for this alternative. Additionally, mitigation for habitat losses due to channelization is difficult to mitigate and cost estimates are unavailable at this time but would probably be high. The project must incorporate a mitigation plan in the construction design to minimize impacts on the steelhead trout and other fishes. For all three alternatives, coordination with the United States Fish and Wildlife Service (FWS) and National Marines Fisheries Services (NMFS) is required.

Table 1: ESTIMATED MITIGATION COSTS FOR THE ALTERNATIVES

ALTERNATIVE	*ACRES IMPACTED*	*REQ PLANTING (ACRES)*	*MITIGATION COST*
1	1.7	3.4	$177,000
2	1.2	2.4	$147,000
3	10.0	20.0	>$675,000

- The 1990 NRCS EIS identified approximately **4.0 acres available** on site for mitigation planting.
- Alternative 3 Cost Does Not Include Costs for Aquatic Habitat Mitigation or Additional Land Costs Needed to Plant 20.0 Acres.
- Est. Costs include drop structures to prevent the entrainment of migrating fish into the bypass channels.

CONCLUSION

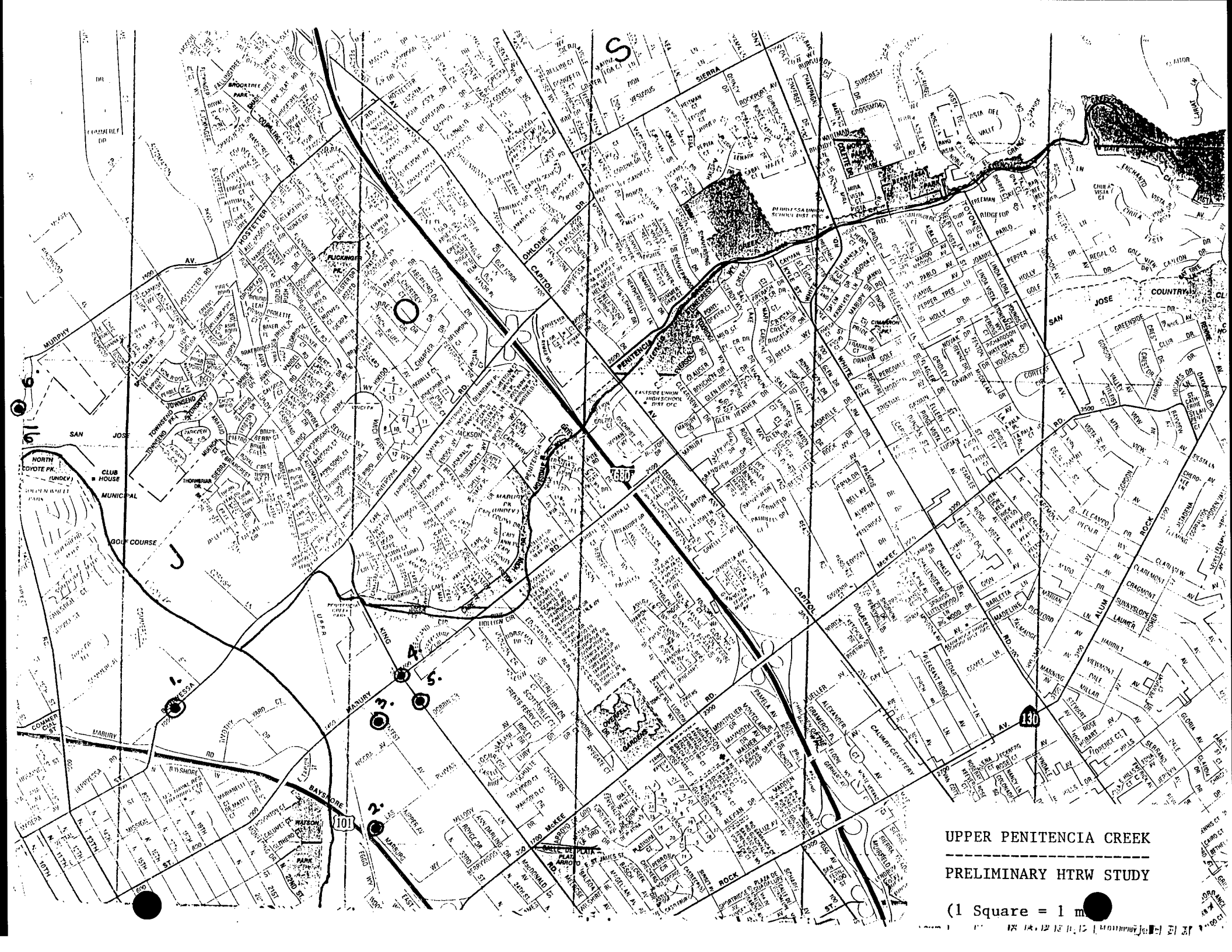
The Upper Penitencia Creek corridor provides scarce and important riparian forest and shaded aquatic habitat, as well as valuable environmental amenities to the surrounding urban landscape. Past land acquisition and planning decisions have left available a sizable corridor of land for use as a floodway. This stands in dramatic contrast to the usual situation in urban areas, where development typically encroaches on the riparian corridor to such an extent that construction of flood control structures requires major alteration of the stream environment. The Upper Penitencia Creek corridor provides an unusually favorable opportunity for construction of an environmentally-sensitive flood control project in a major urban area.

Alternatives 1 and 2 would not cause significant negative environmental impacts, and would provide a major reduction in local flood damages. Alternative 3, while providing similar flood-protection benefits, would also cause significant negative habitat and aesthetic impacts that would be difficult to fully mitigate. These impacts could largely be avoided by implementing Alternative 1 or Alternative 2. An Environmental Impact Statement (EIS) for this urban flood control project should be prepared for all three alternatives.

Table 2: Preliminary Evaluation of Potential HTRW Sites				
SITE #[1]	**SITE NAME AND ADDRESS**	**EPA SUPERFUND SITE?**	**POTENTIAL IMPACT BY PROJECT?**	**COMMENTS**
1	Solvent Service, Incorporated 1021 Berryessa Rd San Jose, California	Yes	No	Last Action 10/22/90
2	DAP Incorporated 520 Marburg Way San Jose, California	No	No	EPA Site Inspection - No Remedial Action Necessary - 9/8/89
3	Economic Labs, Incorporated 640 Lenfest Road San Jose, California	No	No	EPA Assessment - No Remedial Action Necessary - 7/1/88
4	King Road Pond King and Maybury Rd San Jose, California	No	No	EPA Assessment - No Remedial Action Necessary - 10/06/89
5	Best Investments Power Conversion Site 615 North King Rd San Jose, California	N/A[2]	No	Assessed by SCVWD/RWQCB
6	Markovits and Fox 1633 Old Oakland Road San Jose, California	N/A[2]	No	Assessed by SCVWD/RWQCB

1 - Refer to Site Map

2 - Data from SCVWD


UPPER PENITENCIA CREEK
PRELIMINARY HTRW STUDY
(1 Square = 1 m

RESPONSES TO RECOMMENDATIONS FROM THE UNITED STATES FISH AND WILDLIFE SERVICE IN THE DRAFT PLANNING AID REPORT FOR UPPER PENITENCIA CREEK FLOOD CONTROL RECONNAISSANCE, *USFWS*, March 1995.

The following recommendations would provide for conservation of fish and wildlife resources. These recommendations may be modified as more project information becomes available, and following more formal coordination with other involved agencies which may review this draft report.

1. The Corps should design the project to maximally avoid undercut banks, woody debris, and spawning gravels associated with the existing low-flow channel; as compensation mitigation for these stream features are typically infeasible, or expensive.

Impacts to shaded riverine aquatic cover will be avoided to the maximum extent practicable.

2. The project should be designed to prevent, to the maximum extent possible, the entrainment of mitigating fish in the bypass channel. This includes providing a steep drop structure at convergence of the bypass channel with Coyote Creek and screening of bypass diversions.

These will be considered in the feasibility phase.

3. All impacts to woody vegetation should be minimized to the extent possible. Riparian trees that must be removed during construction should be transplanted, if possible, in proposed mitigation areas.

Impacts would be minimized to the extent possible, and riparian trees removed during construction will be mitigated.

4. Studies should be conducted to determine what levels of stream flow should be provided annually through Upper Penitencia Creek to allow the anadromous fishery and associated riparian areas to be conserved and enhanced. Stream flows should be provided to protect the fish and wildlife resources on Upper Penitencia Creek.

This is beyond the scope of study for this flood control project.

5. Mitigation should be provided for any loss of riparian forest and SRA Cover. The mitigation for these losses should take place within the project reaches and should replace habitat values in accordance with the mitigation plan selected. Additional studies to determine specific mitigation recommendations should be based on Habitat Evaluation Procedures (HEP). One important component of the mitigation plan includes instream and overhead cover (components of SRA Cover) is recommended to be replace at a ratio of 1:1 or greater in terms of linear feet, area, and habitat value.

The Corps usually provides full mitigation for loss of these habitat types. However, provision of mitigation may be limited by issues of practicality. A HEP will be done during the feasibility stage.

6. A low-flow channel should be included within all bypass channel designs to ensure safe passage for any entrained fish out of the bypass channel.

The construction of fish ladders are of concern. Ladder gradients need to be low enough not only for migrating adult steelhead, but for juvenile steel head and other native fish as well. Water flows should be supplemented when necessary to provide sufficient passage for fish. Also, any ladders should be maintained and cleared of debris to ensure unimpeded travel up and down the creek. A plunge pool should be provided at the downstream migrating fish.

These will be considered in the feasibility phase.

7. The feasibility of removing the Noble Avenue Diversion structure should be studied to help mitigate for instream fisheries habitat losses. If removal is not possible, then the dam should be managed during winter and spring mitigation (October-May) to improve adult and juvenile fish passage. This includes screening the diversion with a technique appropriate for the range of diverted flows, regular maintenance of the dam, and removal of debris from behind the dam.

The Mabury Road diversion structure should be modified so fish can migrate up and downstream during periods of low flow.

These are mitigation options that could be utilized if Alternative 3 is implemented. This option would not be necessary for Alternatives 1 or 2.

8. The project should comply with the Endangered Species Act:

Determine potential effects of the project on listed or proposed species or critical habitat, by conducting surveys for the species or potential habitat, as appropriate. Should the species or critical habitat are present or potentially affected, a Biological Assessment for the Project should be prepared in order to determine whether species would be affected. Should the proposed action be likely to affect the species or its critical habitat, initiate formal consultation with the Service.

All of these will be done in the feasibility phase.

LITERATURE CITED (CONTINUED)

Davis, Jason, Draft Planning Aid Report for the Upper Penitencia Creek Flood Control Reconnaissance, United States Fish and Wildlife Service, March 1995.

United States Environmental Protection Agency, List of Active and Non-Active Superfund Sites in Santa Clara County, June 1995.

PERSONAL COMMUNICATION

Department of Environmental Health, Santa Clara County, *Request for list of known HTRW sites within the study area,* Santa Clara County, June 23, 1995.

Fuller, Ken, *Telephone conversation requesting an update to the December 1995 Endangered and Threatened Species List*, United States Fish and Wildlife Service, July 8, 1995.

Iwamura, Tom, *Request for list of known HTRW sites within the study area,* Santa Clara Valley Water District, June 23, 1995.

Quint, Jim, *Received list of active and non-active Superfund sites for Santa Clara County,* United States Environmental Protection Agency, June 23, 1995.

Roper, M., **personal communication**, California Department of Fish and Game, Yountville, 1994.

UNITED STATES DEPARTMENT of the INTERIOR

FISH AND WILDLIFE SERVICE

DRAFT PLANNING AID REPORT

FOR THE

UPPER PENITENCIA CREEK FLOOD CONTROL RECONNAISSANCE

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

MARCH 1995

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Sacramento Field Office
2800 Cottage Way, Room E-1803
Sacramento, California 95825-1846

March 20, 1995

Lt. Colonel Michael J. Walsh
District Engineer
San Francisco District, Corps of Engineers
211 Main Street
San Francisco, California 94105-1905

Subject: CESF - Upper Penitencia Creek Flood Control Reconnaissance Study

Dear Colonel Walsh:

This draft planning aid report is provided pursuant to the scope of work for fiscal year 1995. It describes fish and wildlife resources found within the project area, and the impacts that proposed flood control measures along Upper Penitencia Creek may have on these resources. The information provided herein is preliminary in nature and is provided as technical assistance to aid your planning process. It does not constitute our detailed report as called for in Section 2 of the Fish and Wildlife Coordination Act. Our recommendations are based on compensation commensurate with the fish and wildlife values involved.

This report has been coordinated with the California Department of Fish and Game and the National Marine Fisheries Service. Should these or other agencies have additional comments they will be incorporated into the final report. We would appreciate receipt of all comments by April 18, 1995.

We appreciate the opportunity to provide continued input to your planning process. For any further assistance regarding this project, please contact Jason Davis of my staff at (916) 979-2109, extension 331.

Sincerely,

Joel A. Medlin
Field Supervisor

Enclosure

cc: FWS, ARD-ES, Portland, OR
NMFS, Santa Rosa
CDFG, Director, Sacramento
CDFG, Yountville, (Attn: Margaret Roper)

UNITED STATES DEPARTMENT of the INTERIOR

FISH AND WILDLIFE SERVICE

DRAFT PLANNING AID REPORT

FOR THE

UPPER PENITENCIA CREEK FLOOD CONTROL RECONNAISSANCE

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

BY JASON DAVIS

MARCH 1995

INTRODUCTION

In 1994, the U.S. Army Corps of Engineers (Corps) initiated a reconnaissance study to find a feasible alternative for providing flood protection for urban areas along Upper Penitencia Creek in Santa Clara County, California. Presently, there are 1,600 buildings in the floodplain susceptible to flood damage during a 100-year flood event. The objective of this study is to find a feasible alternative to provide 100-year flood protection for these homes.

DESCRIPTION OF THE AREA

The Upper Penitencia Creek watershed is located in Santa Clara County, just south of San Francisco (Figure 1). The creek originates from the Diablo Mountain Range and flows through residential and urban sections of San Jose and Milpitas. The entire watershed encompasses an area of about 24 square miles. The creek is typically intermittent, drying up for several months during the summer of each year; instream flows are highly dependant upon rainfall events. The creek is one of two creeks in the Santa Clara Valley that retains a continuous block of riparian vegetation from Coyote Creek to the Diablo Mountain Range. The Cherry Flat Reservoir partially regulates flows into the creek. The Santa Clara Valley Water District owns and operates several percolation ponds adjacent to the creek which intercept water from the creek. Additionally, water that is imported from the South Bay Aqueduct to the percolation ponds is released into the creek to augment the natural flow of the creek.

Much of the creek is held under public ownership. A master park plan was prepared for Santa Clara County which covered the stretch of creek from Alum Rock Park downstream to the confluence with Coyote Creek. As part of the master plan, areas were designated for park development and a trail system was proposed to link the entire park.

DESCRIPTION OF THE PROJECT

The Upper Penitencia Creek project is divided into 7 reaches, totalling 3.77 miles of creek, as follows (Figure 2):

Reach 1: Dorel Drive to Noble Avenue (0.36 miles)
Reach 2: Noble Avenue to Piedmont Road (0.53 miles)
Reach 3: Piedmont Road to Penitencia Creek Road (0.44 miles)
Reach 4: Penitencia Creek Road to Capitol Avenue (0.57 miles)
Reach 5: Capitol Avenue to Jackson Avenue (0.51 miles)
Reach 6: Jackson Avenue to King Road (0.92 miles)
Reach 7: King Road to Coyote Creek (0.44 miles)

Currently, five alternatives, including the no-action alternative, are being considered for Upper Penitencia Creek.

SOIL CONSERVATION SERVICE (SCS) ALTERNATIVE

A petition was made to the Secretary of Agriculture by two sponsors, the Evergreen Resource Conservation District and the Santa Clara Valley Water District, to prepare a plan for works of improvement along the Upper Penitencia Creek Watershed in the late 1980s. The SCS was directed by the Secretary of Agriculture to complete this study. In August of 1990, an Environmental Impact Report was written (SCS 1990). The layout of the SCS plan is as follows:

Reach 1: Dorel Drive to Nobel Avenue
This reach currently holds a diversion structure located 300 feet upstream of Noble Avenue. This structure, which sends water to a percolation pond in Reach 2, would be widened and a fish passage facility would be provided.

Reach 2: Nobel Avenue to Piedmont Road
A combination of floodwalls and levees would be built throughout this reach on both channel banks. As a result of levee construction, 0.4 acres of a percolation pond would be removed and its diversion pipe would be replaced.

Reach 3: Piedmont Road to Penitencia Creek Road
Levees and floodwalls would be constructed on both sides of the creek along the entire reach. The northwestern section of this reach would be regraded to force overland flows under Penitencia Creek bridge. Further construction would include a riprapped sill, two stabilization structures on the floodplain, and the removal of one driveway bridge.

Reach 4: Penitencia Creek Road to Capitol Avenue
Culverts at Penitencia Creek Road would be replaced by a bridge. Levees and floodwalls would be constructed throughout this reach. The upper 1,000 feet of this reach would be excavated to a maximum depth of 6.5 feet. Also, five transverse groinings would be buried in the floodplain.

At the Capitol Avenue overcrossing, a drop structure would be constructed. This structure would drop the creek elevation by five feet. A fish ladder would be included at the drop structure.

A box culvert would also be constructed at the Capitol Avenue bridge. A low flow channel would be excavated under the bridge.

Reach 5: Capitol Avenue to Jackson Avenue
At this reach, a rock-lined bypass channel would be constructed from downstream of Capitol Avenue to the Interstate 680 bridge. The channel would be lined with rock, covered with soil and seeded with grasses. A low flow channel would be incorporated within the bypass channel design. A maintenance road would be constructed on the northern edge of the bypass channel.

Downstream of the Capitol Avenue bridge, a weir would be constructed to keep low flows (less than 1,400 cfs) within the creek and force high flows (greater than 1,400 cfs) into the bypass channel.

At the Interstate 680 bridge, the creek and the bypass channel would be realigned so water can flow under the existing bridge. A second bypass channel would be constructed, starting 530 feet downstream of Interstate 680. A curved sill would be installed at this point to direct low flows (less than 1,000 cfs) into the creek and divert high flows (greater than 1,000 cfs) into the bypass channel.

To compensate for the loss of a 0.4 acre percolation pond in Reach 2, a new pond would be constructed along this reach.

Reach 6: Jackson Avenue to King Road

The bypass channel would continue as described above through the entire reach. The creek's capacity to carry large flows decreases significantly downstream of its first contact with Mabury Road. An overflow weir would be installed upstream of Mabury Road to divert flows over 400 cfs into the bypass channel.

A drop structure would be constructed 475 feet upstream of the King Road Culvert. The structure would lower the channel 10.8 feet into a concrete lined channel that extends to the King Road culvert. Just upstream of the King Road culvert, the bypass channel would cut through the existing creek. A 45-foot concrete flume would be constructed to carry creek flows over the channel. After this junction, the bypass channel would run directly to Coyote Creek away from Penitencia Creek.

Reach 7: King Road to Coyote Creek

A rectangular concrete channel would be constructed from King Road to the Western Pacific Railroad Bridge. A triple box culvert would be constructed under both the King Road and Western Pacific Railroad bridges. A side-sloping concrete channel would continue from the Western Pacific Railroad bridge to Coyote Creek. These two concrete-lined bypass channel designs do not include a low-flow channel. A concrete drop structure would drop the water 16 feet into Coyote Creek. A fish ladder is not included with this drop structure.

CORPS ALTERNATIVE #1

Reach 1: Dorel Drive to Noble Avenue

No alterations are proposed in this reach.

Reaches 2, 3, and 4: Noble Avenue to Capitol Avenue

Levees and floodwalls would be constructed on both sides of the creek throughout these reaches.

Reach 5: Capitol Avenue to Jackson Avenue

The construction of a bypass channel would begin at Capitol Avenue. The channel would be rock-lined with a six-inch layering of dirt. A low flow channel would be included within the bypass channel.

A portion of the natural channel would be excavated just downstream of Capitol Avenue bridge to provide an entrance for flood flows into the bypass channel.

The bypass channel would realign with the creek at the Interstate 680 overcrossing, and would diverge again just downstream of the 680 overcrossing.

Levees would be constructed along the natural channel within this reach.

Reach 6: Jackson Avenue to King Road

Levees would also be constructed throughout this reach. As the creek nears the King Road bridge, the bypass channel would again converge with the creek. The bypass channel would cross the creek by entering from the north and exiting just opposite where it entered. The bypass channel downstream of the convergence would be a concrete-lined box channel without a low flow channel.

Reach 7: King Road to Coyote Creek

The bypass would enter into Coyote Creek from a concrete-lined side-sloping channel downstream of the Western Pacific Railroad crossing. The bypass would enter Coyote Creek without a drop structure as was proposed under the SCS Alternative.

CORPS ALTERNATIVE #2

The Corps Alternative #2 is similar to the Corps Alternative #1 except as follows: In Reach 5 (Capitol Avenue to Jackson Avenue) the bypass is omitted. Instead, bypass construction would begin downstream, about midway along Reach 6 (King Road to Jackson Avenue). The bypass would be similar in construction as that described in Reach 6 of the Corps Alternative #1. Levees and floodwalls would be constructed along both sides of the creek from Reaches 2 through 6 (Nobel Avenue through King Road).

CORPS ALTERNATIVE #3

The main difference between this alternative and the Corps Alternative #2 is the creek would be channelized from the Upper Penitencia Creek Road to the beginning of the bypass, which lies midway between King Road and Jackson Avenue in Reach 6.

EXISTING BIOLOGICAL RESOURCES

COVER TYPES

Upper Penitencia Creek supports a high-quality riparian corridor, running from Coyote Creek to the Diablo Mountain Range. Throughout Reaches 1, 2, 3, and 4 (Dorel Drive to Capitol Avenue), except for the area adjacent to the percolation ponds which is over-run with non-native eucalyptus, the creek is surrounded by dense stands of native riparian vegetation including large alder (*Alnus rhombifolia*), elderberry (*Sambucus spp.*), cottonwood (*Populus fremontii*), California sycamore (*Plantus racemosa*), and California buckeye (*Aesculus californica*). Many species of willow (*Salix spp.*), ceanothus and blackberry (*Rubus spp.*) also provide good ground cover throughout these reaches.

In Reach 5 (Capitol Avenue to Jackson Road) riparian vegetation occurs, but in younger stands compared with upstream sites; this is due to man-induced impacts from summer dams and the recent Interstate 680 construction. All species are similar to those described above.

Reach 6 (Jackson Road to King Road) has a very diverse riparian cover. Large, greater than 25 inch DBH, coast live oak (*Quercus agrifolia*), cottonwood trees and large elderberry shrubs are found throughout the upper portions of this reach. Further down the reach, decadent stands of black (*Juglans californica*) and English walnut (*Juglans regia*), cottonwoods, and oaks containing many snags occur.

In Reach 7 (King Road to Coyote Creek) the bypass channel would run independent of the creek and its riparian vegetation. This area for the proposed bypass channel contains asphalt and highly degraded patches of grassland.

AQUATIC RESOURCES

The creek supports large expanses of Shaded Riverine Aquatic Cover (SRA). SRA Cover is defined as the nearshore aquatic area occurring at the interface between a river and adjacent woody riparian habitat (Fris and DeHaven 1992). This habitat provides numerous benefits to wildlife species. For instance, the shade that is provided by overhanging vegetation works to reduce water temperatures which are essential for salmonid spawning and rearing. High water temperatures can result in high mortality of redds. Also, juvenile salmonids experience higher levels of predation, disease, and parasitism at warmer temperatures. SRA Cover also provides cover for birds, mammals, and herptofauna that utilize the creek as a food and cover source. Lastly, SRA Cover promotes the establishment of invertebrate food sources to wildlife. Insects congregate around overhanging vegetation and are in turn utilized by fish and birds as a food source.

The anadromous steelhead trout (*Oncorhynchus mykiss*) is one of the principal fish species found in Upper Penitencia Creek. This run of steelhead has been cited as the only significant one of its kind in the South San Francisco Bay (USFWS 1987). This species has been petitioned for listing under the Federal Endangered Species Act. The National Marine Fisheries Service, which has responsibility for this and other anadromous fish species, should be contacted regarding any potential impacts to steelhead.

Ulmer (1988) describes Upper Penitencia Creek as having the best potential for steelhead rearing and nursery habitat in the entire Santa Clara County water system. Through the first four years of the Summer Dams Fisheries Study (Habitat Restoration Group 1994), Upper Penitencia Creek was found to hold temperatures that remained suitable for salmonid survival throughout the summer. The Ulmer study found steelhead present in the creek system in February of 1986 and August and November of 1987. Steelhead redds were surveyed in the plunge pool below the Piedmont Avenue drop structure during the 1992-93 field season (Margaret Roper, CDFG, pers. comm. 1994).

A variety of other non-anadromous fish species have been identified as inhabiting Upper Penitencia Creek. The Habitat Restoration Group surveyed two sites (Alum Pock Park and Linda Vista) along the creek for fish and observed their habitat from May of 1992 to September of 1994. During their study, they recorded high numbers (> 20) of riffle sculpin (*Cottus gulosus*), California roach (*Hesperoleucus symmetricus*), and green sunfish (*Lepomis cyanellus*).

Prickly sculpin (*Cottus asper*), inland silverside (*menidia beryllina*), goldfish (*Carassius auratus*), and Sacramento suckers (*Catostomus occidentalis*) were also collected. They noted that at both sites and at most times, there was a good food supply present for the fish. The food available included mites, caddisflies, damselflies, mayflies, snails and flatworms.

Historically, natural runs of coho salmon (*Oncorhynchus kisutch*) probably used Upper Penitencia Creek for spawning (Skinner 1962).

WILDLIFE

The Upper Penitencia Watershed provides good habitat for many species of wildlife. The percolation ponds attract dabbling ducks and shorebirds. The relatively abundant riparian vegetation contributes toward providing good habitat for ducks, shorebirds, and passerines. Rough-winged swallows (*Stelgidopteryx serripennis*), black phoebes (*Sayornis nigricans*), western flycatchers (*Empidonax difficilis*), belted kingfishers (*Ceryle alcyon*) are known to utilize these habitats (SCS 1990).

Upper Penitencia Creek holds one of only two continuous riparian corridors that reaches from Coyote Creek to the Diablo Mountain Range. Riparian corridors provide cover elements for migrating mammals. Mammals expected in the area include black-tailed deer (*Odocoileus hemionus*), squirrels (*Sciurus spp.*), raccoons (*Procyon lotor*), numerous mouse species (*Peromyscus spp.*), opossums (*Didelphis marsupialis*), and bats.

A few reptiles and amphibians are known to inhabit the area including; garter snakes (*Thamnophis spp.*), western fence lizards (*Sceloporus occidentalis*), western toads (*Bufo boreas*), and Pacific treefrogs (*Hyla regilla*).

Appendix A is a list of species observed on the Fish and Wildlife Service (Service) staff's site visit on December 21, 1994.

ENDANGERED SPECIES

A list of endangered and threatened species for the project area was prepared by the Service on December 22, 1994, and submitted to the Corps. This list and a summary of a Federal agency's responsibilities under Section 7(a) and (c) of the Endangered Species Act of 1973, as amended (Act) are contained in Appendix B. We recommend that the Corps also review its requirements, published in 50 CFR 402, for compliance with the Act.

Included below are brief discussions of the federally-listed species which may be found within the project area. This should be regarded as preliminary information, which we are providing only to assist the Corps in preparation of a Biological Assessment, should one be deemed necessary. The Service has consultation responsibility for the federally-listed species that may be affected by the project, and this office should be contacted regarding further consultation requirements. The California Department of Fish and Game should be contacted regarding any species which is listed under the California Endangered Species Act.

The tidewater goby (*Euclyclogobius newberryi*) (Endangered), is a native Californian species that inhabits semi-closed estuaries or lagoons of small coastal streams. It grows no greater than 5 cm (2 in) and prefers streams with low salinity levels. The decline of the tidewater goby is mainly due to habitat loss resulting from the manipulation of these coastal streams by man (McGinnis 1984).

The San Joaquin kit fox (*Vulpes macrotis mutica*) (Endangered), smallest of the fox species, inhabits arid regions of western North America. They live in grasslands or grassy open stages of vegetation dominated by scattered brush, shrubs and scrub. The kit fox is generally nocturnal, spending most of the daylight hours in elaborately constructed dens. Burrows can be as long as 6 to 15 feet, consisting of numerous tunnels and chambers which are dug in light sandy loam soils in areas of gentle slope. During the summer, an individual fox may use as many as 4 or more dens each month to avoid fleas. Home ranges overlap and are usually not greater than 1-2 square miles. During the breeding season, adults and pups occupy more complex dens which belong to specific family groups and are probably constructed over many years (SJVDP 1990).

The breeding season lasts from December to February, and females give birth to an average litter of four pups in February or March. Both parents hunt and provide food for the pups until May or June, and families disperse to nonbreeding dens in July or August (SJVDP 1990).

The primary factor contributing to the decline of the kit fox is the conversion of suitable habitat to irrigated agriculture. In addition to the loss of its habitat, researchers have reported dramatic declines in kit fox populations due to shooting, trapping, burying in dens during land leveling, poisoning through secondary ingestion of rodenticides and vehicle traffic mortalities (SJVDP 1990).

The California red-legged frog (*Rana aurora draytonii*) (Proposed Endangered) is a highly aquatic frog which occurs in the vicinity of quiet, permanent pools of streams, marshes, and occasionally ponds. Adults eat aquatic and terrestrial insects, crustaceans, snails, worms, fish, tadpoles, and smaller frogs. Aquatic larvae are mostly herbivorous. Loss of habitat and the introduction of exotic predators are a concern (Zeiner et al. 1990).

The robust spineflower (*Chorizanthe robusta*) (Proposed Endangered) is endemic to sandy soils of coastal habitats in southern Santa Cruz and northern Monterey Counties. Coastal dune and coastal scrub communities are present, but portions have been impacted by recreational use, urban development, and military activities. Dune communities have also been altered in composition by the introduction of non-native species, especially sea-fig or ice plant (*Carpobrotus spp.*) and European beachgrass (*Ammophila arenaria*), in an attempt to stabilize shifting sands (USFWS 1991).

The Santa Clara Valley dudleya (*Dudleya setchellii*) (Proposed Endangered) is a low-growing perennial of the stone crop family with fleshy, glabrous leaves. It is restricted to rocky outcrops within serpentine grassland in Santa Clara County. It is found only in the Coyote Valley area, from San Jose south about

30 km (20 miles) to San Martin, at elevations of 100 to 300 m (300 to 900 ft) (Bartel 1993).

The Metcalf Canyon jewelflower (*Streptanthus albidus ssp. albidus*) (Proposed Endangered) is an annual herb of the mustard family (Brassicaceae) that reaches up to 1 m (3 ft) in height. It is endemic to serpentine outcrops with little soil development. It can be locally abundant but its range is limited, extending less than 30 km (20 miles) from San Jose south to Anderson Lake (McCarten 1992). The plant is threatened by urbanization and offroad vehicles.

FUTURE CONDITIONS WITHOUT THE PROJECT

VEGETATION

Vegetation within the Upper Penitencia Creek watershed should remain relatively the same under without project conditions. There is the possibility that, under the Penitencia Creek Park Plan, some impact to vegetation could occur. One component of the plan is to build a continuous trail system which runs along Upper Penitencia Creek from Alum Rock Park downstream to Coyote Creek which could impact vegetation during the construction process.

FISH

It is hard to predict how fish populations may be affected in the future under without project conditions. Much of their fate rest with the amounts of water released by the SCVWD through their percolation ponds. We assume, for purposes of this report, that water release schedules would remain as under existing conditions.

WILDLIFE

There are no expected changes in the abundance or diversity of wildlife populations if this project is not constructed.

FUTURE CONDITIONS WITH THE PROJECT

VEGETATION

SCS Preferred Alternative

The SCS preferred alternative is predicted to impact 1.7 acres of riparian habitat as well as several large native and non-native individual trees due to the construction of overflow weirs, rock lined sills, drop structures, crossover structures and modifications to existing bridges (SCS 1990). There would be minor impacts during the 2,900 feet of floodwall construction near the creek in Reaches 3 and 4. Although most construction would occur along pre-existing roads, tree roots would be severed as trenches are dug for floodwall stability. There would be additional minor riparian impacts associated with levee and maintenance road construction.

Corps Alternative #1

In the absence of more detailed project plans, the Service concludes that impacts to vegetation would be basically identical to those described under the SCS alternative. These conclusions are based on sketches provided by the Corps which show construction activities which match those described in the SCS alternative. We are assuming that construction techniques would be identical under both alternatives.

Corps Alternative #2

Under this alternative, impacts to riparian vegetation would be reduced due to impact avoidance at the Capitol Avenue and Interstate 680 bridges. This alternative could result in a 68 percent (approximate) decrease in riparian acreage impact.

Corps Alternative #3

Alternative #3 has a channelization component that would significantly impact riparian vegetation. The proposed plan would channelize 8,000 feet of stream from Penitencia Creek Road downstream to a midpoint between Jackson Avenue and King Road. The channelization of the stream would impact all vegetation that occurs adjacent to the stream throughout the entire channelized stretch. It is unlikely that the area would be revegetated due to the rock riprapped layer applied to the stream banks. We assume that the channel and banks would be maintained free of woody vegetation.

FISH

SCS Preferred Alternative

The project is expected to remove 755 lineal feet of riparian forest habitat which occurs adjacent to the creek. The SRA Cover associated with the habitat provides immense benefits to migrating salmonids. SRA Cover provides shade which helps conceal fish and lowers water temperatures. Leaf fall provides a food source for aquatic insects thus, more fish food. Such habitat values would be lost for aquatic species; in addition, downstream areas would also become less suitable for many fish species, as a result of reduced water quality.

The diversion of high flows into the bypass channel would reduce the scouring effect that floods provide in the natural channel. Scouring of the natural channel removes the buildup of sediment which is an obstacle for spawning steelhead.

The construction of fish ladders at the Capitol Avenue bridge and the Noble Avenue weir would present problems for migrating fish. Fish ladder construction on similar creeks in the San Jose Area have presented more of a barrier to fish migration than a benefit (Roper, CDFG, pers. comm. 1994). Margaret Roper stated three reasons why this is so: (1) the fish ladders have been poorly designed; (2) there is never enough water for fish migration except during flood events; and (3) fish ladders are not maintained or cleared of debris. Thus, we believe that alternative measures to provide fish passage, such as removal of existing barriers, should be considered prior to the incorporation of fish ladders into the project design.

Another impact to fisheries may occur at the many entrances to the bypass

channel. During high flow events, up- or downstream migrating fish may be attracted to the bypass channel. If fish should be entrained into the bypass channel they may find it hard to escape. The bypass channel upstream of King Road would include a low flow channel that would provide adequate water depths for fish to swim safely if entrained, but the bypass channel just downstream of King Road does not. Should fish be drawn into this concrete-lined, flat channel, stranding problems could result if flow levels are not high enough to allow unimpeded passage. Also, most downstream bypass exits involve drop structures which would be nearly impossible to pass unless very high flows are present. Lastly, the bypass channels would provide minimal protection from predators such as birds.

The concrete flume just above King Road may also cause problems for migrating fish. This structure would induce sheet flows, which would make migration impossible during low flows. Also, losses of protective cover could increase predation upon migrating fish, especially juveniles.

Corps Alternative #1

Impacts would be similar to the SCS preferred alternative. One difference would occur at the Coyote Creek and Penitencia Creek convergence. The Corps alternative does not propose a drop structure here so the chances of migrating steelhead entering the bypass channel are increased. However, should steelhead enter the channel, they would be threatened with stranding, when flows are reduced in the flat bottomed, concrete-lined channel. Should these fish pass the flat bottomed channel into the rock-lined channel, they again could be trapped; it would be nearly impossible to exit the bypass channel into Penitencia Creek unless flows were high enough for them to climb the drop structure present at the various diversion points.

The construction of a concrete flume, which would carry the natural creek over the proposed bypass channel, is not included within this alternative so fish migration impediments from this structure would be avoided.

Corps Alternative #2

Impacts to fisheries would be similar to those described under the Corps Alternative #1 except for those impacts at the Capitol Avenue and Interstate 680 bypass entrances. No construction is proposed at that these sites so entrainment losses would be avoided.

Corps Alternative #3

The expected impacts for this proposed alternative differs from the SCS alternative in several respects. First, fish ladders would not be built so they are not of concern under this alternative. Second, entrainment losses at both the Capitol Avenue and Interstate 680 diversion structure are not a concern here as they would not be built. Third, a diversion structure would be built mid-way between King Road and Jackson Avenue, which would have similar impacts as the diversions discussed under the SCS alternative. Fourth, the proposed channelization of the creek from Penitencia Creek Road to the beginning of the bypass (midway between Jackson Avenue and King Road) would have potentially enormous impacts upon fish. Channelization would result in the loss of 8,000 feet of streambank vegetation on both sides of the creek. As mentioned earlier, SRA habitats contain overhanging vegetation

which reduces water temperatures, provides escape cover, and increases the propagation of aquatic insects. There would be losses of riffle and pool habitats throughout this reach. Riffles and pools are essential for fish as they channel food, provide escape cover from predators, and allow for instream habitat diversity. Channelization would essentially cause sheet flows through the channel, thus creating potential barriers to up- and downstream migration during low flow conditions.

WILDLIFE

SCS Preferred Alternative

Most effects to wildlife species would occur as a result of vegetation removal. During removal of riparian vegetation in the creek channel, many resident small mammals, reptiles, and amphibians would be destroyed. If vegetation removal in the riparian corridor occurs during the breeding season, nesting birds in and adjacent of vegetation removal areas will also be adversely impacted. Furthermore, losses would be permanent within the creek, resulting in a net overall loss of wildlife habitat and interruption of the existing riparian corridor.

There would also be impacts in areas where floodwall construction blocks wildlife movements. During flood events, this could result in the loss of individuals that are unable to find refugial cover.

Corps Alternative #1

Impacts will be identical to the SCS Preferred Alternative.

Corps Alternative #2

The types of impacts to wildlife under this proposed alternative will be similar to those explained in the SCS plan, but the acreage of impact would be smaller, due to the reduced amount of vegetation that would be removed.

Corps Alternative #3

Under this alternative, impacts to wildlife would be much higher then those explained under the SCS preferred alternative due to the larger amount of vegetation that would be removed. A major component of the existing riparian corridor would be lost as a result of this alternative.

DISCUSSION

FISH AND WILDLIFE SERVICE MITIGATION POLICY

The recommendations herein for mitigation and the protection of fish and wildlife resources conform with the Service's Mitigation Policy as published in the Federal Register (46:15 January 23, 1981). The Mitigation Policy provides Service personnel with guidance in making recommendations to protect, conserve, and enhance fish and wildlife resources. The policy helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The intent of the policy is to ensure protection and conservation of valuable fish and wildlife resources.

Under the Mitigation Policy, resources are assigned to one of four distinct Resource Categories, each having a mitigation planning goal which is consistent with the fish and wildlife habitat values involved. The Resource Categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be much more common and of relatively lesser value to fish and wildlife.

In applying the Mitigation Policy during an impact assessment, each specific habitat or cover-type which may be impacted by the project is identified. Evaluation species which utilize each habitat or cover-type are then selected for Resource Category determination. Selection of evaluation species can be based on several rationales, including: (1) species known to be sensitive to specific land and water use actions; (2) species that play a key role in nutrient cycling or energy flow; (3) species that utilize a common environmental resource; or (4) species that are associated with important resource problems, such as anadromous fish and migratory birds, as designated by the Director or Regional Directors of the Service. Evaluation species used for Resource Category determinations may or may not be the same evaluation elements used in an application of the Service's Habitat Evaluation Procedures (HEP), if one is conducted. Finally, based on the relative importance of each specific habitat to its selected evaluation species, and the habitat's relative abundance, the appropriate Resource Category and associated mitigation planning goal are determined.

Mitigation goals range from "no loss of existing habitat value" (Resource Category 1) to "minimize loss of habitat value" (Resource Category 4). The goal for Resource Category 2 is "no net loss of in-kind habitat value"; to achieve this goal, any unavoidable losses of habitat value would need to be replaced in-kind. As defined in the Mitigation Policy, "in-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost.

Under Pacific Region Fish and Wildlife Service guidance, we are also pursuing a goal of no net loss of wetland acreage, while seeking a net overall gain in the quality and quantity of wetlands through restoration, development and enhancement. Furthermore, the Service believes that wetlands compensation, which is the restoration or creation of wetlands to offset losses, should only be deemed acceptable when losses are determined to be unavoidable and compensation is known or believed to be technically feasible. Restoration of former or degraded wetlands is the preferred form of compensatory mitigation, followed by wetlands creation. These general goals regarding wetlands are used in the Service's analyses and recommendations relative to all proposed projects.

In recommending mitigation for adverse impacts to any of these habitats, the Service uses the same sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These mitigation steps (in order of preference) are: avoidance, minimizing, rectification measures, measures to reduce or eliminate impacts over time, and compensation measures.

The proposed project has two distinct cover-types which would be impacted by

the construction of this project; riparian forest, and riverine habitat with it's associated SRA Cover. In association with one another, these cover-types are uniquely characterized as areas of high wildlife species diversity, species density, and productivity. Exchanges of nutrients, energy, and species with the bordering upland and aquatic systems contributes to these qualities.

The evaluation species selected for the riparian forest areas are the migratory songbirds which occur in the project area. Migratory birds were selected because (1) Service's responsibility for their management under the Migratory Bird Treaty Act, (2) their relatively high value for non-consumptive human uses such as bird-watching, and (3) because of their values as indicator species for the overall groups or guilds to which they belong. Riparian forests along the creek provide important cover, nesting, roosting, and foraging habitat for these birds. The riparian forest is of high value to these evaluation species, despite its proximity to urban development. This is in part because of the relative paucity of remaining riparian forest areas in the San Jose area, due to the extensive development and modification of the floodplain over the last 50 to 100 years.

We have thus designated the riparian habitat in the project area along Upper Penitencia Creek as Resource Category 2, which has a mitigation goal of "no net loss of in-kind habitat value" or acreage; to achieve this goal, any unavoidable losses of habitat value would need to be replaced in-kind.

Riverine habitat and associated SRA Cover is that portion of the project area which is typically inundated by flowing water; this includes the streambed and its adjacent low banks. Impounded areas which occur within percolation ponds are not considered SRA Cover. The value of riverine habitats to fish and wildlife is dependant upon a number of factors, including: (1) degree of shading and materials input from adjacent riparian vegetation; (2) presence or absence of undercut banks; (3) variation of primary stream characteristics such as riffles, runs, and pools; and (4) amount of woody debris in the water.

Also, as discussed in other sections, the adjacent riparian forest contributes much to the habitat values of SRA Cover. Several critically important attributes of the stream are lost when the riparian forest immediately adjacent to the river is destroyed.

The evaluation species selected for the riverine habitat of the proposed project is the steelhead trout. Steelhead trout was chosen because (1) of its use of the gravel beds along the steam bottom for spawning, (2) the use of the stream for rearing by juvenile steelhead before immigrating to the ocean, and (3) their high value to sport and commercial fisheries. Riverine habitat is of high value to the evaluation species and is scare in the region; therefore, we are also designating this habitat as Resource Category 2, with its associated mitigation planning goal of no net loss of in-kind habitat value. This would include no less that full compensation (in terms of acreage, lineal feet, and/or overall habitat value) for the following SRA Cover and general stream components: (1) undercut banks, (2) stream shading, (3) streamside vegetation, (4) instream woody debris, (5) instream spawning gravels, and (6) relative percentages of riffles, runs and pools.

TABLE 1: Evaluation species, resource categories, and Service mitigation planning goals for the habitat types found along Upper Penitencia Creek.

Habitat Type	Evaluation Species	Resource Category	Mitigation Goal
Riparian	Migratory Songbirds Guild	2	No net loss of in-kind habitat value or acreage
Riverine	Steelhead Trout	2	No net loss of in-kind habitat value or acreage

One of the proposed alternatives, the SCS preferred alternative, cites possible opportunities to mitigate for lost vegetation through tree planting. The project proposes to plant 4.0 acres at 7 sites located along the projects reach. The mitigation plan would provide approximately 0.90 acres of in-kind SRA habitat, 1.55 acres of riparian corridor habitat which would be beneficial to wildlife, 0.30 acres of vegetation surrounding a proposed percolation pond, and 1.25 acres of out of kind mitigation with limited benefits for wildlife.

The three proposed Corps alternatives make no mention of proposed mitigation at this time.

In many past instances involving such flood control projects, the riparian forest replacement efforts have been conducted in areas which are separated from the stream channel, either by a levee, a high berm, or by riprapped bank. This situation has often led to severe losses of stream (e.g. SRA Cover) habitat values, despite the mitigation efforts. Riparian forest replantings which are placed on channel banks, however, provide both terrestrial and aquatic habitat values, and thus are of higher preference to the Service. The Service has recently produced two reports (USFWS 1992, Fris and DeHaven 1993) which document the value of SRA Cover and its related riparian vegetation along the Sacramento River; the concepts in these documents generally apply as well for smaller streams such as Upper Penitencia Creek. We recommend that these Service documents be carefully reviewed and applied when considering a final mitigation plan for this project.

RECOMMENDATIONS

The following recommendations would provide for conservation of fish and wildlife resources. These recommendations may be modified as more project information becomes available, and following more formal coordination with other involved agencies which may review this draft report.

1. The Corps should design the project to maximally avoid undercut banks, woody debris, and spawning gravels associated with the existing low-flow channel; as compensation mitigation for these stream features are typically infeasible, or expensive.

2. The project should be designed to prevent, to the maximum extent possible, the entrainment of migrating fish in the bypass channel. This includes providing a steep drop structure at convergence of the bypass channel with

Coyote Creek and screening of bypass diversions.

3. All impacts to woody vegetation should be minimized to the extent possible. Riparian trees that must be removed during construction should be transplanted, if possible, in proposed mitigation areas.

4. Studies should be conducted to determine what levels of stream flow should be provided annually through Upper Penitencia Creek to allow the anadromous fishery and associated riparian areas to be conserved and enhanced. Stream flows should be provided to protect the fish and wildlife resources on Upper Penitencia Creek.

5. Mitigation should be provided for any loss of Riparian Forest and SRA Cover. The mitigation for these losses should take place within the project reaches and should replace habitat values in accordance with the mitigation plan selected. Additional studies to determine specific mitigation recommendations should be based on Habitat Evaluation Procedures (HEP). One important component of the mitigation plan includes instream and overhead cover (components of SRA Cover) is recommended to be replaced at a ratio of 1:1 or greater in terms of linear feet, area, and habitat value.

6. A low-flow channel should be included within all bypass channel designs to ensure safe passage for any entrained fish out of the bypass channel.

7. The construction of fish ladders are of concern. Ladder gradients need to be low enough not only for migrating adult steelhead, but for juvenile steelhead and other native fish as well. Water flows should be supplemented when necessary to provide sufficient passage for fish. Also, any ladders should be maintained and cleared of debris to ensure unimpeded travel up and down the creek. A plunge pool should be provided at the downstream end of any constructed ladder to prevent injury to downstream migrating fish.

8. The feasibility of removing the Noble Avenue Diversion structure should be studied to help mitigate for instream fisheries habitat losses. If removal is not possible, then the dam should be managed during winter and spring migration (October-May) to improve adult and juvenile fish passage. This includes screening the diversion with a technique appropriate for the range of diverted flows, regular maintenance of the dam, and removal of debris from behind the dam.

9. The Mabury Road diversion structure should be modified so fish can migrate up- and downstream during periods of low flow.

10. The project should comply with the Endangered Species Act:

    a. Determine potential effects of the project on listed or proposed species or critical habitat, by conducting surveys for the species or potential habitat, as appropriate.

    b. Should the species or critical habitat are present or potentially affected, a Biological Assessment for the Project should be prepared in order to determine whether species would be affected.

c. Should the proposed action be likely to affect the species or its critical habitat, initiate formal consultation with the Service.

DATA NEEDS

The Service has identified the following data needs, should the project proceed to a feasibility-level study. At that time, other data needs may be identified, based on the project description.

1. Large-scale aerial photos (at a >=1:2000 resolution) for each reach of the creek between Dorel Drive to Coyote Creek would be needed. Also, aerial photos would be needed for those stretches of the proposed bypass that do not occur within the creek, such as the section of bypass from King Road to Coyote Creek.

2. Data is needed on vegetation distribution, especially for riparian and any other wetland habitats. SRA Cover components such as riffle pool distribution, undercut bank distribution, woody debris presence, and the degree of vegetative shading need to be surveyed in the impact areas.

BUDGET

The following is an estimated budget for completion of a Draft Fish and Wildlife Coordination Act Report for this project by the Service. These estimates are subject to change and revision, however, depending on changes in project plans. Because limited funding was available for preparation of this PAR and field work was not done, substantial field work and surveys still need to be accomplished. We have based our estimates for completion of a HEP (or other habitat based analyses) on the assumptions that (1) the Corps and other resource agencies will have personnel available to participate as HEP team members, and (2) the acreage information, maps, aerial photographs, and project plans requested in the recommendations and data needs sections will be provided by the Corps in a timely manner. Cost estimates for the habitat evaluations would likely escalate if either of these conditions are not met.

Relative to such transfer funding, the cost per biologist day for Service's Sacramento Field Office is currently (fiscal year 1995) $650.00. The predicted costs per biologist day for fiscal year 1996 is $700.00. Thus, costs can be determined by multiplying the number of biologist days by 650 or 700 depending on which year the study will occur.

A. Habitat-based assessment	
HEP team meetings	6 BDs
Field work/travel	10 BDs
Model selection	2 BDs
Data analysis	5 BDs
Write-up	10 BDs
SUBTOTAL	33 BDs

B. Preparation of the Draft CAR

Coordination Meetings and Travel	10 BDs
Writing the Draft Coordination Act Report	20 BDs
Project review	5-10 BDs
In-house review	5 BDs
SUBTOTAL	40-45 BDs
TOTAL	73-78 BD's

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11. U.S. Fish and Wildlife Service. 1991. Endangered and Threatened Wildlife and Plants; Proposed Endangered Status for 5 Plants From Sandy and Sedimentary Soils of Central Coastal California. Federal Register Vol. 56, No. 206.

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PERSONAL COMMUNICATION

Roper, M., personal communication. California Department of Fish and Game. Yountville, CA. 1994.

APPENDIX A

Wildlife species spotted along Upper Penitencia Creek during a field visit on Tuesday, December 21, 1994.

Birds

Bushtit
Mourning dove
Rock Dove
Northern Flicker
Red-tailed Hawk
Anna's Hummingbird
Scrub Jay
Steller's Jay
Dark-eyed Junco
Belted Kingfisher
Ruby-crowned Kinglet
Northern Mockingbird
Black Phoebe
American Robin
House Sparrow
White-crowned Sparrow
European Starling
Hermit Thrush
Brown Towhee
Yellow-rumped Warbler
Hairy Woodpecker

Mammals

Black-tailed Deer
Eastern Fox Squirrel

APPENDIX B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER
SECTIONS 7(a) AND (c) OF THE ENDANGERED SPECIES ACT

Section 7(a): Consultation/Conference
Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species; 2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after determining the action may affect a listed species; and 3)Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

Section 7(c): Biological Assessment - Major Construction Activity[1]
Requires Federal Agencies or their designees to prepare a Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action[2] on listed and proposed species. The process begins with a Federal agency requesting from FWS a list of proposed and listed threatened and endangered species. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the list, the accuracy of the species list should be verified with the Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may proceed; however, no construction may begin.

We recommend the following for inclusion within the BA: an on-site inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species or suitable habitat are present; a review of literature and scientific data to determine species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within FWS, State conservation departments, universities, and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of indirect effects of the proposal on the species and its habitat; an analysis of alternative actions considered. The BA should document the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed or proposed species will be affected. Upon completion, the BA should be forwarded to our office.

---

[1]A construction project (or other undertaking having similar physical impacts) which is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332(2)C).

[2]"Effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Sacramento Field Office
2800 Cottage Way, Room E-1803
Sacramento, California 95825-1846

In Reply Refer To:
1-1-95-SP-214

December 22, 1994

Mr. Roderick A. Chisholm, II
Chief, Planning Branch
Planning/Engineering Division
Corps of Engineers-San Francisco
211 Main Street
San Francisco, California 94105-1905

Subject: Species List for Proposed Reconnaissance Study of Possible Flood Control Along Upper Penitencia Creek, Santa Clara County, California

Dear Mr. Chisholm:

As requested by letter from your agency dated November 22, 1994, you will find enclosed a list of listed, proposed and candidate species that may be present in the subject project area (see Enclosure A). This list fulfills the requirement of the Fish and Wildlife Service to provide a species list pursuant to Section 7(c) of the Endangered Species Act, as amended, (ACT).

Pertinent information concerning the distribution, life history, habitat requirements, and published references for the listed species is available upon request. This information may be helpful in preparing the biological assessment for this project, if one is required. Please see Enclosure B for a discussion of the responsibilities Federal agencies have under Section 7(c) of the Act and the conditions under which a biological assessment must be prepared by the lead Federal agency or its designated non-Federal representative.

Formal consultation, pursuant to 50 CFR § 402.14, should be initiated if you determine that a listed species may be affected by the proposed project. If you determine that a proposed species may be adversely affected, you should consider requesting a conference with our office pursuant to 50 CFR § 402.10. Informal consultation may be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to a listed species. If a biological assessment is required, and it is not initiated within 90 days of your receipt of this letter, you should informally verify the accuracy of this list with our office.

We have included the candidate species that may be present in the project area (see Enclosure A). These species are currently being reviewed by our service and are under consideration for possible listing as endangered or threatened.

Candidate species have no protection under the Endangered Species Act, but are included for your consideration as it is possible that one or more of these candidates could be proposed and listed before the subject project is completed. Should the biological assessment reveal that candidate species may be adversely affected, you may wish to contact our office for technical assistance. One of the potential benefits from such technical assistance is that by exploring alternatives early in the planning process, it may be possible to avoid conflicts that could otherwise develop, should a candidate species become listed before the project is completed.

We appreciate your concern for endangered species. If you have further questions, please call Laurie Stuart Simons of this office at (916) 979-2725, extension 330. If you have any questions regarding wetlands, contact Mike Aceituno at (916) 979-2113.

Sincerely,

for Joel A. Medlin
Field Supervisor

Enclosures

cc: FWS-SFO (Corps Projects)

ENCLOSURE A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OR MAY BE AFFECTED BY PROPOSED RECONNAISSANCE STUDY OF POSSIBLE FLOOD CONTROL MEASURES ALONG UPPER PENITENCIA CREEK, SANTA CLARA COUNTY, CALIFORNIA (1-1-95-SP-214, DECEMBER 23, 1994)

Listed Species

Fish

tidewater goby, *Euclyclogobius newberryi* (E)

Mammals

San Joaquin kit fox, *Vulpes macrotis mutica* (E)

Proposed Species

Amphibians

California red-legged frog, *Rana aurora draytonii* (PE)

Plants

robust spineflower, *Chorizanthe robusta* (PE)
Santa Clara Valley dudleya, *Dudleya setchellii* (PE)
Metcalf Canyon jewelflower, *Streptanthus albidus* ssp. *albidus* (PE)

Candidate Species

Fish

longfin smelt, *Spirinchus thaleichthys* (2)

Amphibians

California tiger salamander, *Ambystoma californiense* (1)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (2)

Mammals

Pacific western big-eared bat, *Plecotus townsendii townsendii* (2)
greater western mastiff-bat, *Eumops perotis californicus* (2)
riparian brush rabbit, *Sylvilagus bachmani riparius* (1)
San Francisco dusky-footed woodrat, *Neotoma fuscipes annectens* (2)

Plants

alkali milk-vetch, *Astragalus tener* var. *tener* (2R)
valley spearscale, *Atriplex joaquiniana* (2)
Mt. Hamilton thistle, *Cirsium fontinale* var. *campylon* (2)
South Bay clarkia, *Clarkia concinna* ssp. *automixa* (2)
northcoast bird's-beak, *Cordylathus martimus* var. *hooveri* (1)

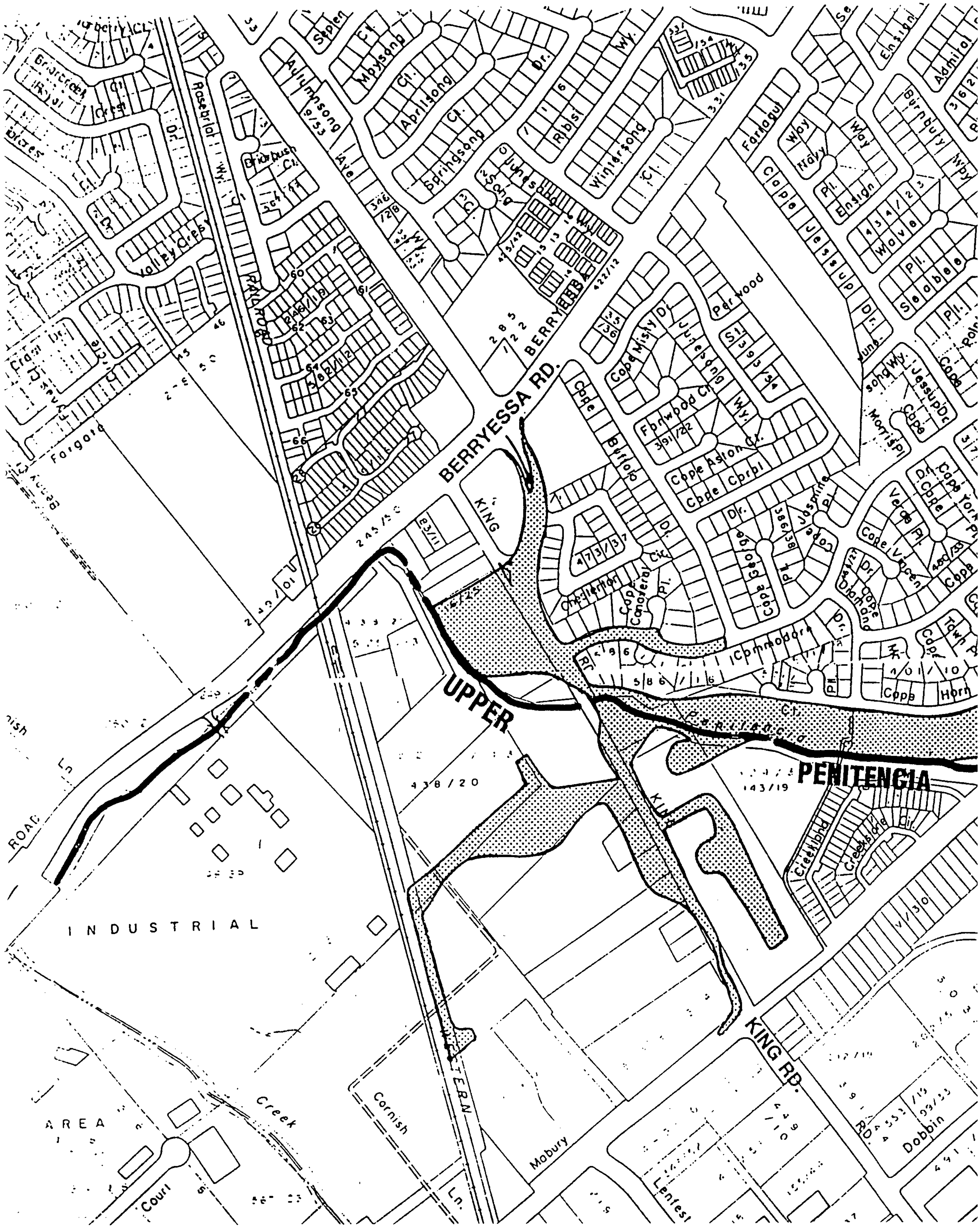
Hoover's button-celery, *Eryngium aristulatum* var. *hooveri* (1)
pappose spikeweed, *Hemizonia parryi* ssp. *congdonii* (1)
Contra Costa goldfields, *Lasthenia conjugens* (1)
delta tule-pea, *Lathyrus jepsonii* var. *jepsonii* (2)

(E)--Endangered (T)--Threatened (P)--Proposed (CH)--Critical Habitat
(1)--Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
(2)--Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.
(1R)-Recommended for Category 1 status.
(2R)-Recommended for Category 2 status.
(▪)--Listing petitioned.
(*)--Possibly extinct.

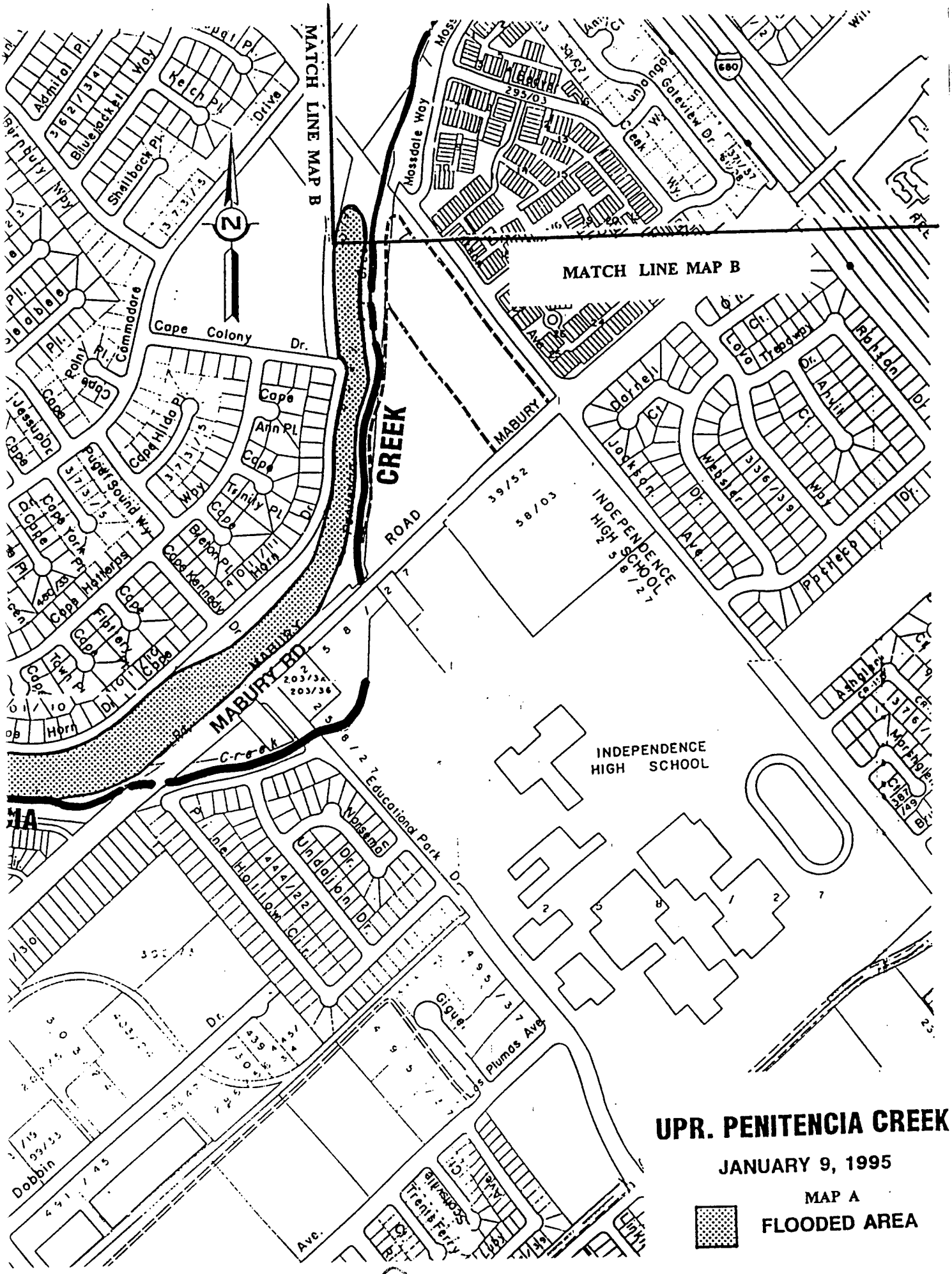
APPENDIX C

FLOODED AREA, 9 JANUARY 1995

NOTE: MAPS PROVIDED BY SANTA CLARA VALLEY WATER DISTRICT



BERRYESSA RD.
UPPER
PENITENCIA
KING RD.
INDUSTRIAL
AREA
Creek
RAILROAD
Cornish
Mabury
Dobbin
Court
Commodore
Perwood
Autumnsong
Aprilsong
Springsong
Wintersong
Farragut



UPR. PENITENCIA CREEK

JANUARY 9, 1995

MAP A

FLOODED AREA

UPR. PENITENCIA CREEK

JANUARY 9, 1995

MAP B

FLOODED AREA

NO MATCH LINES

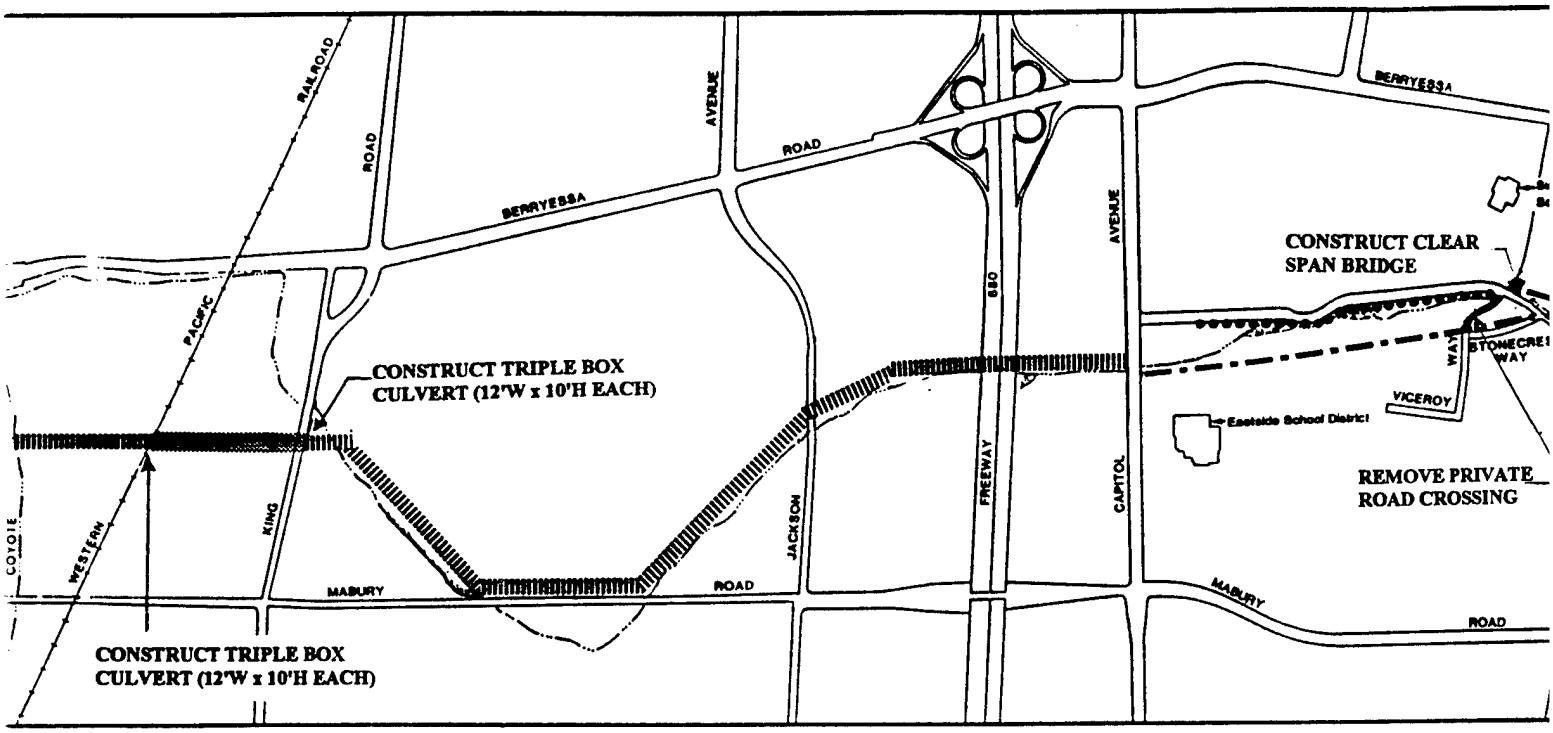
UPR. PENITENCIA CREEK

JANUARY 9, 1995

FLOODED AREA

APPENDIX D

ALTERNATIVE DESIGNS



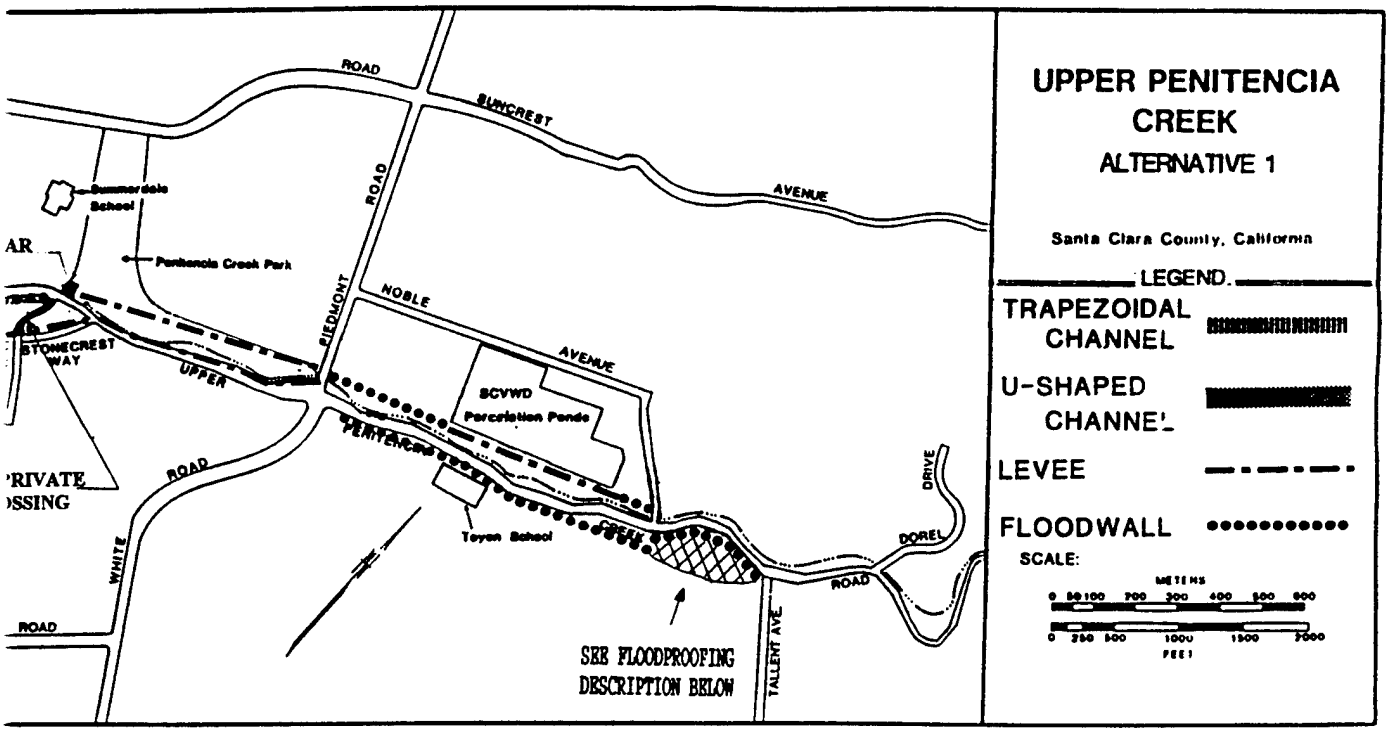
FLOODPROOFING VARIATION

ALTERNATIVE 1A: Raise 14 Homes

ALTERNATIVE 1B: Construct Floodwall ar
Removable Flood Shield

ALTERNATIVE 1C: No Floodproofing Provi

(1)

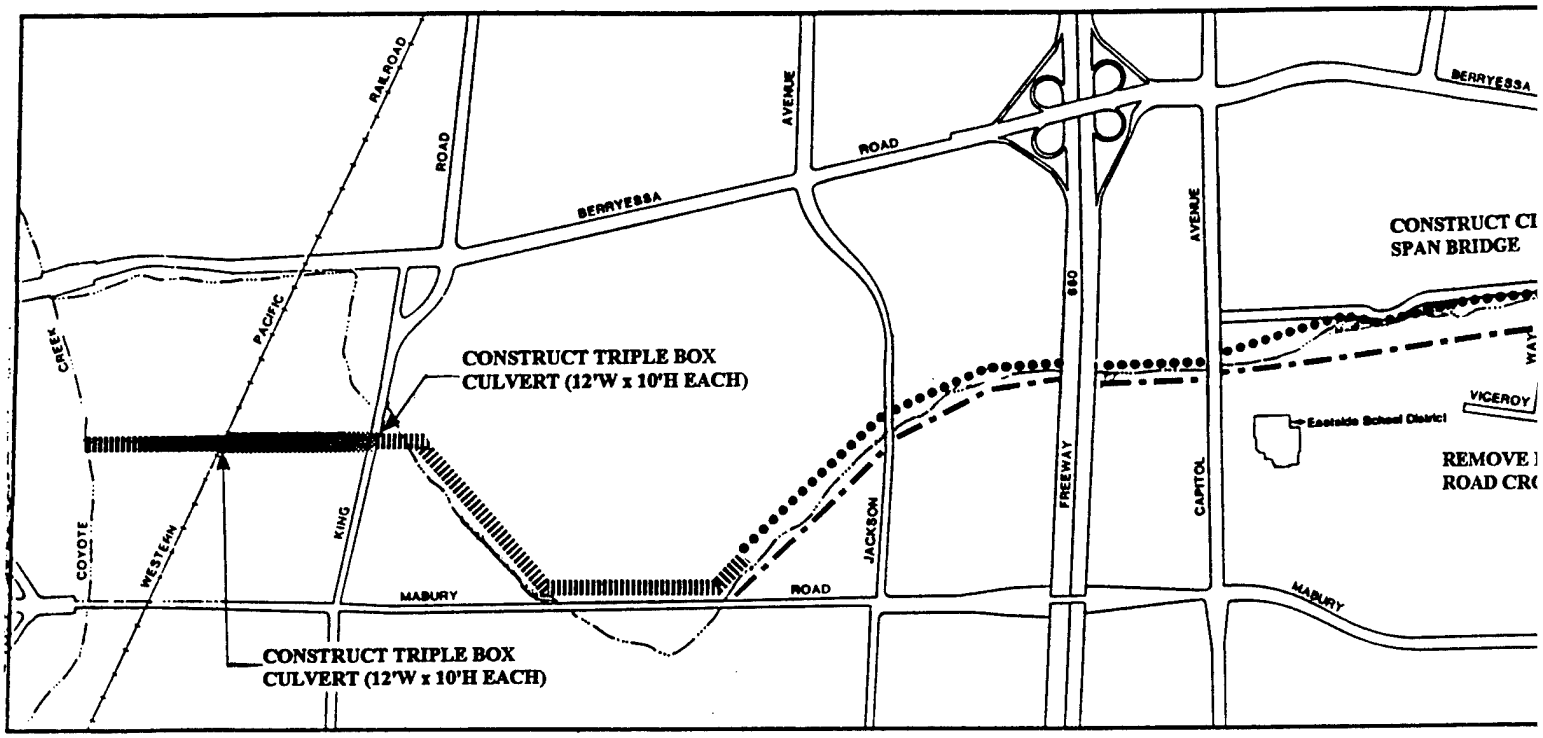


ICATIONS

ıll and Provide
Shields for Driveways

Provided for 14 Homes

(2)

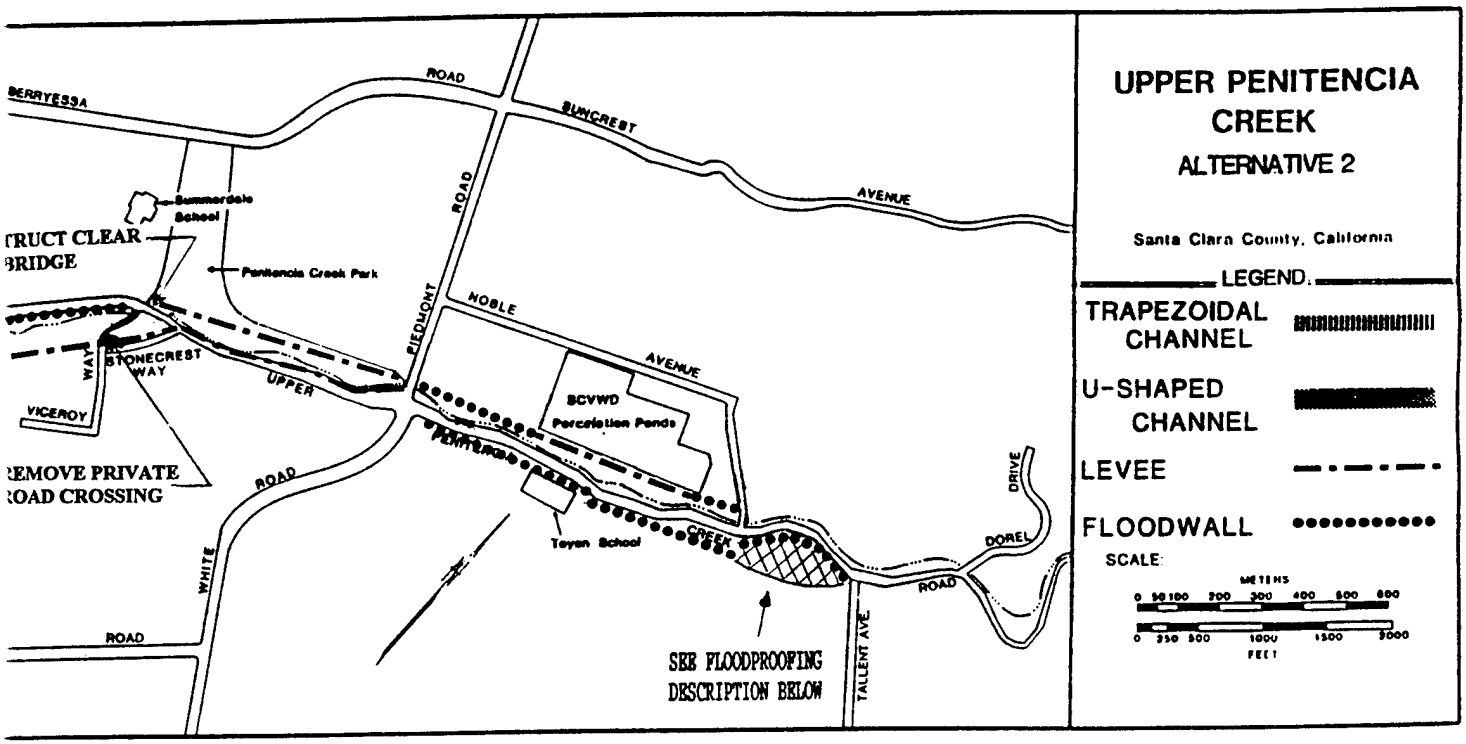


FLOODPROOFING VA

ALTERNATIVE 2A: Raise 14 Homes

ALTERNATIVE 2B: Construct Flood
Removable Flood

ALTERNATIVE 2C: No Floodproofin

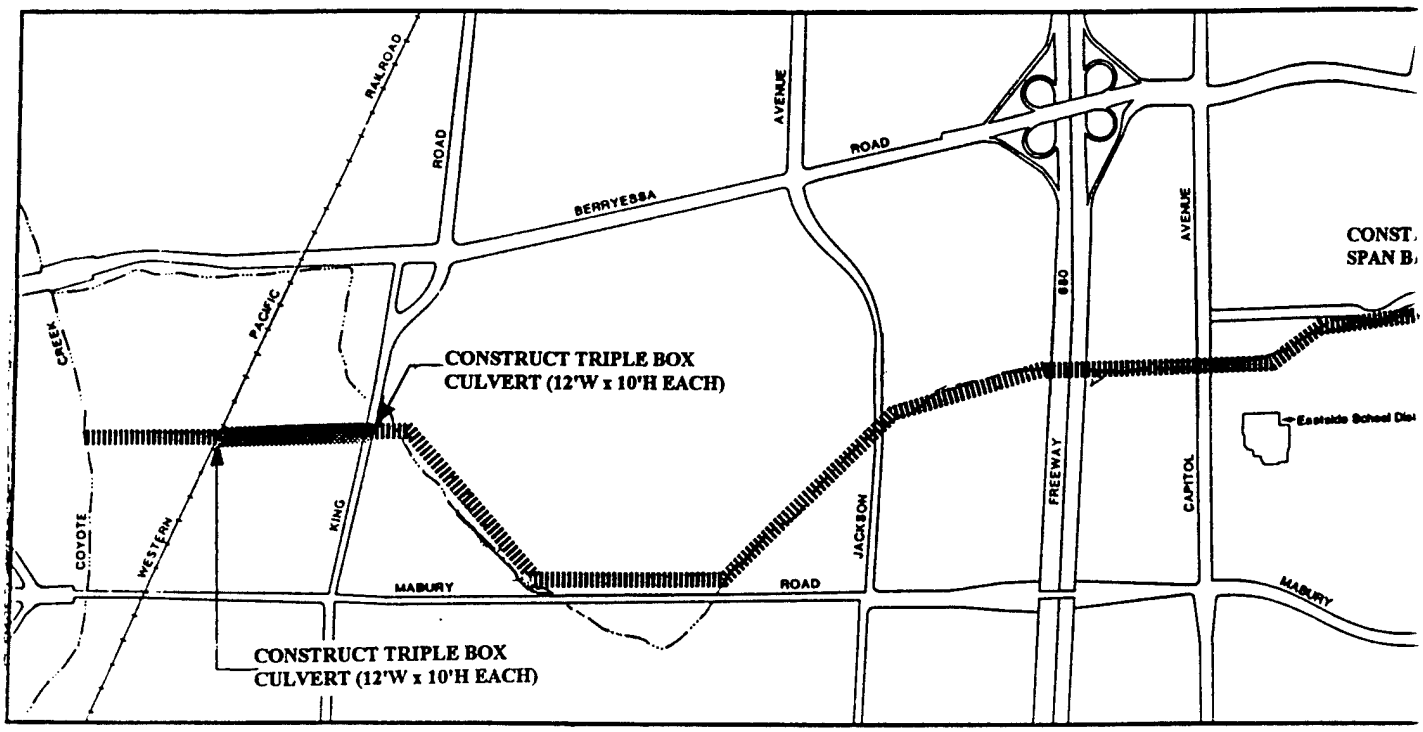


NG VARIATIONS

omes

Floodwall and Provide
Flood Shields for Driveways

oofing Provided for 14 Homes

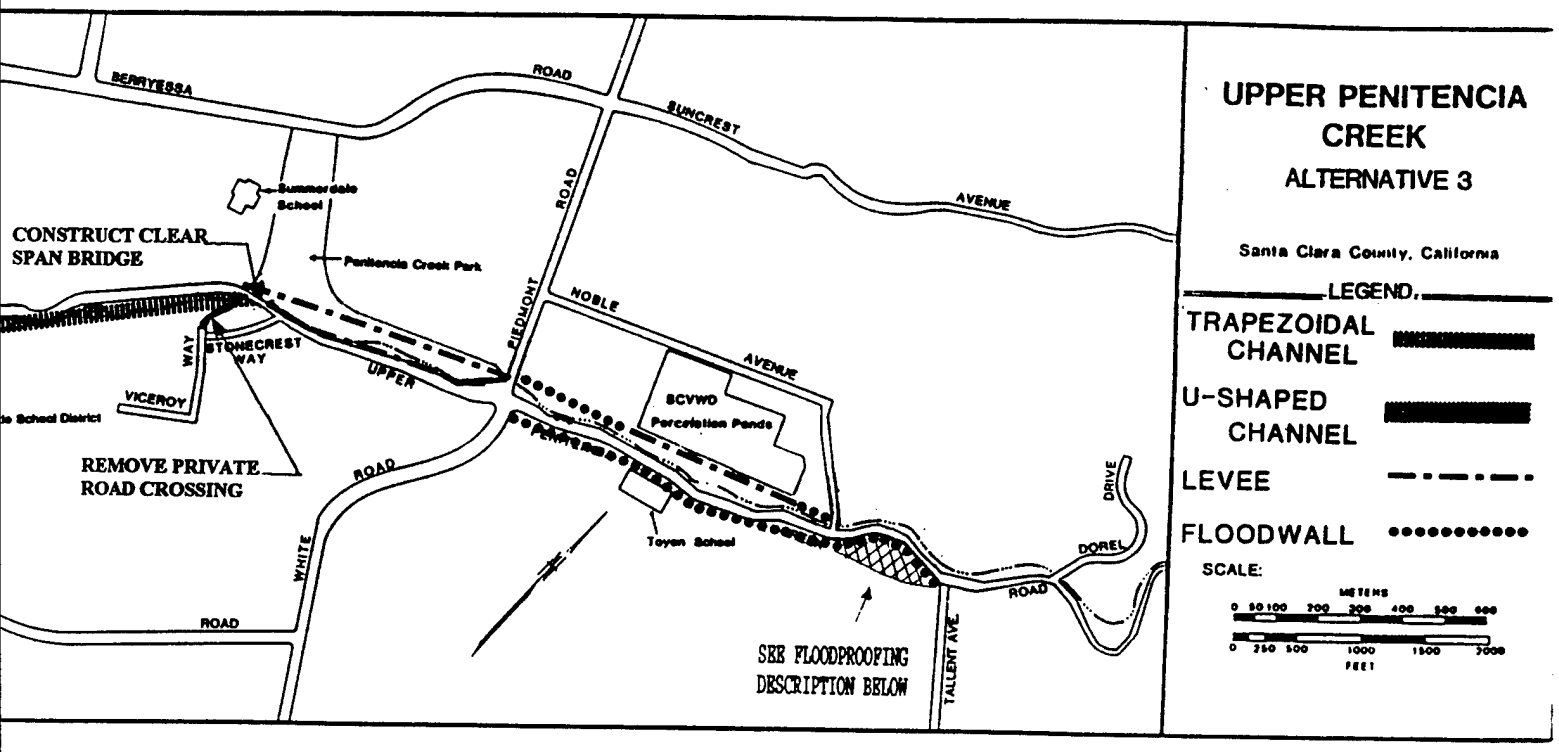


FLOODPROOFIN

ALTERNATIVE 3A: Raise 14 Hc

ALTERNATIVE 3B: Construct F
Removable F

ALTERNATIVE 3C: No Floodpro



OOFING VARIATIONS

14 Homes

ıct Floodwall and Provide
ole Flood Shields for Driveways

odproofing Provided for 14 Homes

APPENDIX E

100-YEAR AND 500-YEAR FLOODPLAINS

UPPER PENITENCIA CREEK FLOODPLAIN MAP

(MAP A)

Santa Clara County, California

Legend

100 year floodplain

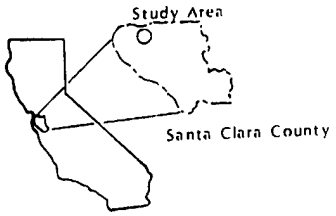
500 year floodplain

Scale

2000 1000 0 1000 2000

scale in feet

Location



Floodplain map prepared by

U.S. Department of Agriculture

Soil Conservation Service

Photogrammetric base map prepared by

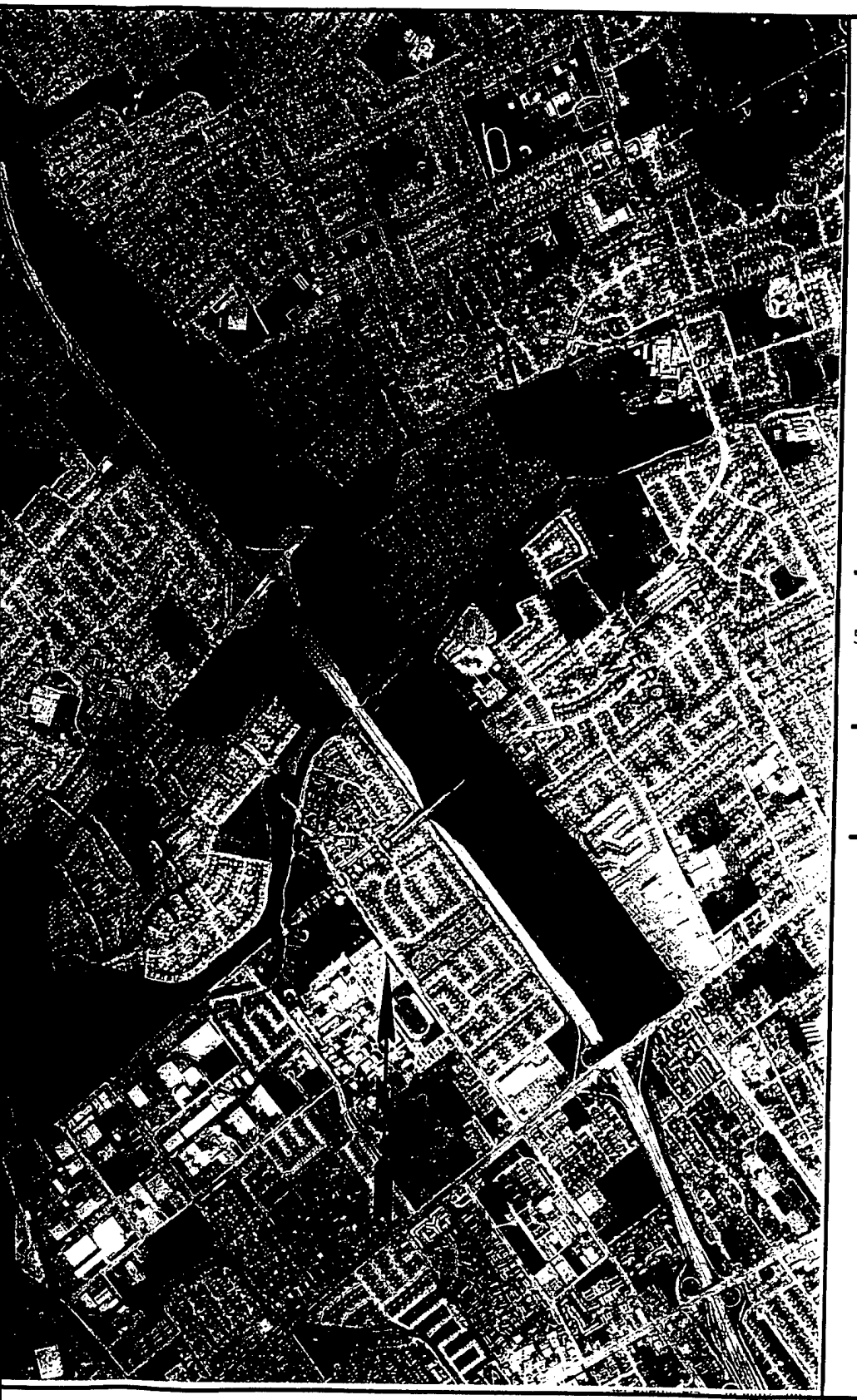
AERO-GEODETIC CORPORATION

Date of Photography 1-17-84

For Santa Clara Valley Water District

(2)

Map inset shows 100 year floodplain upstream of Piedmont Road.



UPPER PENITENCIA CREEK FLOODPLAIN MAP

(Map B)

Santa Clara County, California

Legend

100 year floodplain ■

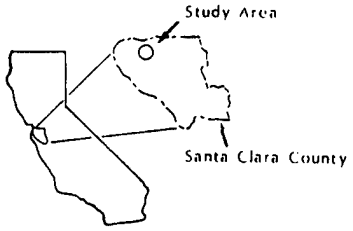
500 year floodplain ▩

Scale

2000 1000 0 1000 2000

scale in feet

Location



Floodplain map prepared by

U.S Department of Agriculture

Soil Conservation Service

Photogrammetric base map prepared by

AERO-GEODETIC CORPORATION

Date of photography 1-17-84

for Santa Clara Valley Water District

Road.

APPENDIX F

REAL ESTATE REPORT

REAL ESTATE REPORT
FOR THE
UPPER PENITENCIA CREEK
FLOOD CONTROL STUDY
RECONNAISSANCE REPORT
July 1995

1. General Description.

a. Study Description. The study addresses the need to reduce flood damages to the residential, commercial, and industrial properties which are repeatedly impacted by flood events along Upper Penitencia Creek in Santa Clara County, California. It includes several alternatives to prevent and/or alleviate flood damages such constructing floodwalls, levees, bypass channels, and bridge improvements.

b. The authority for this study is contained in the Flood Control Act of 18 August 1941, which authorized a preliminary examination and survey of the Guadalupe River, its tributaries and adjacent streams.

c. Real Estate Requirements and Estates.

Channel Improvement Easement	-	131.93 acres
Temporary Work Area Easement	-	7.38 acres
Mitigation Lands - Fee (Reach 4 & 5)	-	6.46 acres
Temporary House Raising and Channel Improvement Easement	-	3.76 acres

Three structural alternatives and one no-action alternative were considered in this study. Alternative 1A: (Modified Floodplain with Bypass Downstream - Flood Proofing/Raise Structures) was originally studied by the Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service (SCS). The project site footprints for Alternatives 2 and 3 differ from Alternative 1 only in the mitigation sites. The actual project land area encompassed by each alternative are the same, except that Alternative 3 would require mitigation lands off-site. However, these mitigation lands (and their associated costs) were not determined within this study since Alternative 3 is likely to be dismissed due to environmental considerations. Thus, the Real Estate Division prepared a single cost estimate for Alternative 1A, and this estimate was applied to the other alternatives, as well.

2. Public Law 91-646 Relocations and Benefits. Due to the ordinance for designated floodways discussed further in this report, there are assumed to be no Public Law 91-646 relocations.

3. Utility Relocations. Utility/facilities relocations were not addressed for this report. Should the project advance to a Feasibility Study, they will be investigated at that time.

4. Sponsor. Santa Clara Valley Water District (SCVWD), the proposed non-Federal Sponsor, has a real estate staff and experience in acquiring real estate for County, State, and Federal projects. SCVWD presently owns lands within the project boundaries. Because no Federal project currently exists in the study area, the Water District has never previously received credit for these lands under a Federal flood control project.

5. Baseline Cost Estimate - Local authorities have informally designated a 100-year floodway along the banks of Upper Penitencia Creek for nearly 20 years. In 1977 Santa Clara County prepared the Penitencia Creek Park Master Plan, which was developed in cooperation with the Santa Clara Valley Water District, the City of San Jose Parks and Recreation Department, and other organizations. This plan states "Where development has occurred along the Creek, a floodplain has been designated by the Santa Clara Valley Water District in anticipation of the 100-year flood, but to date is not implemented." This floodplain is an integral component of the master plan and is incorporated into the recreational trail plan and grading of the park. The recommendations of the plan state that the "natural processes of the Creek system" can be utilized to provide flood control and recreation opportunities.

In 1981 the Agreement for the Joint Use of Lands of the Upper Penitencia Creek Park Chain By and Among Santa Clara Valley Water District, County of Santa Clara and City of San Jose was executed. This tri-lateral agreement endorses the Master Plan and directs the SCVWD to obtain fee title to privately owned lands in the designated floodway.

At the suggestion and guidance of the South Pacific Division Real Estate office the following assumptions were made in preparing this reconnaissance level real estate cost estimate: (1) that the proposed ordinance designating floodways in the project has been codified and implemented and (2) that corresponding historical market data is available for four value areas: all lands inside the designated floodway, without regard to ownership, all lands outside the designated floodway, all mitigation lands, and any temporary work areas.

Lands inside the floodway	$1,355,300.00
Lands outside the floodway	76,875.00
Mitigation lands	1,858,272.00
Temporary Construction Easement	469,579.00
Severance Damage	376,002.00
Contingency	940,006.00
Total for Lands	$5,076,034.00
Rounded to	$5,100,000.00

6. Mineral Activity. There is no historical evidence of any marketable minerals being present in the land required for the project.

APPENDIX G

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APPENDIX H

FCSA, PSP, LETTER OF INTENT

D R A F T A G R E E M E N T

BETWEEN
THE UNITED STATES OF AMERICA
AND
THE SANTA CLARA VALLEY WATER DISTRICT

FOR THE
FEASIBILITY PHASE STUDY OF THE UPPER PENITENCIA CREEK

THIS AGREEMENT, entered into this _____ day, of _____, 1995, by and between the United States of America (hereinafter called the "Government"), represented by the Contracting Officer executing this Agreement, and the Santa Clara Valley Water District (hereinafter called the "Sponsor"),

WITNESSETH, that

WHEREAS, the Flood Control Act of 18 August 1941 authorized a preliminary examination and survey of the Coyote River (now known as Coyote Creek), its tributaries and adjacent streams; and,

WHEREAS, Section 4 of the Act states that the Secretary of War is authorized and directed to cause preliminary examinations and surveys for flood control, to be made under the direction of the Chief of Engineers, in drainage areas, which included the Coyote Creek and tributaries, California; and,

WHEREAS, the Corps of Engineers has conducted a Reconnaissance Study of the Upper Penitencia Creek, a tributary of Coyote Creek, pursuant to this authority, and has determined that further study in the nature of a "Feasibility Phase Study" (hereinafter called the "Study") is required to fulfill the intent of the study authority interest in the examination of flood control along Upper Penitencia Creek; and

WHEREAS, the Water Resources Development Act of 1986, Public Law 99-662, specifies the cost-sharing requirements applicable to the Study; and,

WHEREAS, the Sponsor has the authority and capability to furnish the cooperation hereinafter set forth and is willing to participate in study cost sharing and financing in accordance with the terms of this agreement; and,

WHEREAS, the Sponsor and the Government both understand that entering into this agreement in no way obligates either party to implement a project and that whether a project is supported for authorization and budgeted for implementation depends upon the outcome of the Study and whether the proposed solution is consistent with the Economic and Environmental Principles and

Guidelines for Water and Related Land Resources Implementation Studies and with the budget priorities of the Administration and that at the present time, favorable budget priority is being assigned to projects providing primarily commercial navigation and flood or storm damage reduction outputs; and,

NOW THEREFORE, the parties agree as follows:

ARTICLE I - DEFINITIONS

For the purposes of the Agreement:

a. The term "Study Cost" shall mean all disbursements by the Government pursuant to this Agreement, whether from Federal appropriations or from funds made available to the Government by the Sponsor, and all Negotiated Costs of work performed by the Sponsor pursuant to this Agreement. Such costs shall include, but not be limited to: labor charges; direct costs; overhead expenses; supervision and administration costs; and contracts with third parties, including termination or suspension charges; and any termination or suspension costs (ordinarily defined as those costs necessary to terminate ongoing contracts or obligations and to properly safeguard the work already accomplished) associated with this Agreement.

b. The term "Study Period" shall mean the time period for conducting the Study, commencing with the issuance of initial Federal feasibility funds following the execution of this Agreement, and ending with the issuance of the Division Engineer's Public Notice. The "Study Phase" concludes when the report is submitted to the Office of Management and Budget (OMB) by the Assistant Secretary of the Army for Civil Works (ASA(CW)) for review of consistency with the policies and programs of the President.

c. The term "Negotiated Cost" is the fixed fee for a work item to be accomplished by the Sponsor as in-kind services as specified in the Project Study Plan incorporated herein which is acceptable to both parties.

ARTICLE II - OBLIGATIONS OF PARTIES

a. The sponsor and the Government, using funds contributed by the Sponsor and appropriated by the Congress, shall expeditiously prosecute and complete the Study, currently estimated to be completed in 37 months from the date of this Agreement, substantially in compliance with Article III herein and in conformity with applicable Federal laws and regulations, the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, and mutually acceptable standards of engineering practice.

b. The Government and the Sponsor shall each contribute, in cash and in-kind services, fifty (50) percent of all Study Costs, which total cost is currently estimated to be $2,139,000,

as specified in Article IV herein; provided, that the Sponsor may, consistent with applicable Federal statutes and regulations, contribute up to twenty-five (25) percent of the Study Costs as in-kind services; provided further, the Government shall not obligate any cash contribution by the Sponsor toward Study Costs until such cash contribution has actually been made available to it by the Sponsor.

c. No Federal funds may be used to meet the local sponsor share of study costs under this Agreement unless the expenditure of such funds is expressly authorized by statute as verified by the granting agency.

d. The award of any contract with a third party for services in furtherance of this Agreement which obligates Federal appropriations shall be exclusively within control of the Government. The award of any contract by the Sponsor with a third party for services in furtherance of this Agreement which obligates funds of the Sponsor and does not obligate Federal appropriations shall be exclusively within the control of the Sponsor, but shall be subject to applicable Federal statutes and regulations.

e. The Government and the Sponsor shall each endeavor to assign the necessary resources to provide for the prompt and proper execution of the Study and shall, within the limits of law and regulation, conduct the Study with maximum flexibility as directed by the Executive Committee established by Article V, herein.

f. The Government will not continue with the Study if it determines that there is no solution in which there is a Federal interest or which is not in accord with current policies and budget priorities unless the Sponsor wishes to continue under the terms of this Agreement and the Department of Army, at its discretion, grants an exception. If a study is discontinued, it shall be concluded according to Article XII and all data and information shall be made available to both parties.

g. The Sponsor may wish to conclude the Study if it determines that there is no solution in which it has an interest or which is not in accord with its current policies and budget priorities. When such a case exists, the Study shall be concluded according to Article XII and all data and information shall be made available to both parties.

ARTICLE III - PROJECT STUDY PLAN

Attachment 1, the Project Study Plan (PSP), is hereby incorporated into this Agreement. The parties to this Agreement shall substantially comply with the Project Study Plan in prosecuting work on the Study. The following modifications, to be approved by the Executive Committee, shall require an amendment to this Agreement:

a. Any modification which increases the total Study Costs by more than 5 (five) percent (see Attachment 1, page 23);

b. Any modification in the estimated cost of a Study work item or any obligation for a Study work item, which changes the total cost of that work item by more than 5 (five) percent (see Attachment 1, pages 16-23);

c. Any extension of the Study completion date of more than thirty (30) days (see Attachment 1, page 24); or

d. Any reassignment of Study work item between the Sponsor and the Government (see Attachment 1, pages 16-23).

ARTICLE IV - METHOD OF PAYMENT

a. The Government shall endeavor to obtain during each fiscal year the appropriation for that fiscal year at least in the amounts specified in the Project Study Plan incorporated herein. Subject to the enactment of Federal appropriations and the allotment of funds to the Contracting Officer, the Government shall then fund the Study at least in the amounts specified in the Project Study Plan herein.

b. The Sponsor shall endeavor to obtain during each Government fiscal year the cash contribution for that Government fiscal year at least in the amounts specified in the Project Study Plan incorporated herein and, once it has obtained funds for a cash contribution, shall make such funds available by the Sponsor subject to the provisions of this Agreement.

c. Funds made available by the Sponsor to the Government and not disbursed by the Government within a Government fiscal year shall be carried over and applied to the cash contribution for the succeeding Government fiscal year; provided, that upon Study termination any excess cash contribution shall be reimbursed to the Sponsor after a final accounting, subject to the availability of appropriations, as specified in Article XII herein.

d. Should either party fail to obtain funds sufficient to make obligations or cash contributions or to incur Study Costs in accordance with the schedule included in the Project Study Plan incorporated herein, it shall at once notify the Executive Committee established under Article V herein. The Executive Committee shall determine if the Agreement should be amended, suspended, or terminated under Article XII herein.

ARTICLE V - MANAGEMENT AND COORDINATION

a. Overall study management shall be the responsibility of an Executive Committee. Committee members from the Corps of Engineers are the District Engineer, LTC Michael Walsh; Acting Deputy District Engineer for Project Management, Mr. Arijs Rakstins; and Chief of The Planning and Engineering Division,

Mr. William Angeloni. Members from the Santa Clara Valley Water District are the Assistant General Managers, Ms. P. Kay Whitlock and Mr. Bob Smith; Flood Control Manager (currently vacant); and Project Management Head, Mr. Stan Wolfe.

b. To provide for consistent and effective communication and prosecution of the items in the Project Study Plan, the Executive Committee shall appoint representatives to serve on a Study Management Team.

c. The Study Management Team will coordinate all matters relating to prosecution of the Study and compliance with this Agreement, including cost estimates, schedules, prosecution of work elements, financial transactions and recommendations to the Executive Committee for termination, suspension or amendment of this Agreement.

d. The Study Management Team will prepare periodic reports on the progress of all work items for the Executive Committee.

ARTICLE VI - DISPUTES

a. The Study Management Team shall endeavor in good faith to negotiate the resolution of conflicts. Any dispute arising under this Agreement which is not disposed of by mutual consent shall be referred to the Executive Committee. The Executive Committee shall resolve such conflicts or determine a mutually agreeable process for reaching resolution or for termination under Article XII herein.

b. Pending final decision of a dispute hereunder, or pending suspension or termination of this Agreement under Article XII herein, the parties hereto shall proceed diligently with the performance of this Agreement.

ARTICLE VII - MAINTENANCE OF RECORDS

The Government and the Sponsor each shall keep books, records, documents and other evidence pertaining to study costs and expenses incurred pursuant to this Agreement to the extent and in such detail as will properly reflect total Study Costs. The Government and the Sponsor shall maintain such books, records, documents and other evidence for inspection and audit by authorized representatives of the parties to this Agreement. Such material shall remain available for review for a period of three (3) years following the termination of this Agreement.

ARTICLE VIII - RELATIONSHIP OF PARTIES

a. The parties to this Agreement act in an independent capacity in the performance of their respective functions under this Agreement, and neither party is to be considered the officer, agent, or employee of the other.

b. To the extent permitted by applicable Federal law, any reports, documents, data, findings, conclusions, or recommendations pertaining to the Study shall not be released outside the Executive Committee or the Study Management Team; nor shall they be represented as presenting the views of either party unless both Parties shall indicate agreement thereto in writing.

ARTICLE IX - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, or other elected official, shall be admitted to any share or part of this Agreement, or to any personal benefit that may arise therefrom.

ARTICLE X - FEDERAL AND STATE LAWS

In acting under its rights and obligations hereunder, the local sponsor agrees to comply with all applicable Federal and state laws and regulations, including section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) and Department of Defense Directive 5500.II issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations, as well as in Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

ARTICLE XI - COVENANT AGAINST CONTINGENT FEES

The local sponsor warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the local sponsor for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this Agreement without liability, or, in its discretion, to add to the Agreement or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE XII - TERMINATION OR SUSPENSION

a. This Agreement shall be terminated at the completion of the Study Period; provided that prior to such time and upon thirty (30) days written notice, either party may terminate or suspend this Agreement without penalty.

b. Within ninety (90) days upon termination of this Agreement the Study Management Team shall prepare a final accounting of Study Costs, which shall display disbursements by the Government of Federal funds, cash contributions by the Sponsor, and credits for the Negotiated Costs of the Sponsor. Subject to the availability of funds, within thirty (30) days thereafter, the Government shall reimburse the Sponsor for the excess, if any, of cash contributions and credits given over fifty (50) percent

of total Study Costs. Within thirty (30) days thereafter, the Sponsor shall provide the Government any cash contributions required so that the total Sponsor share equals fifty (50) percent of the total Study Costs.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first written.

THE UNITED STATES OF AMERICA

BY_____
MICHAEL J. WALSH
Colonel, Corps of Engineers
District Engineer

STUDY SPONSOR

BY_____
RONALD ESAU
General Manager,
Santa Clara Valley Water District

ATTACHMENT 1 - Project Study Plan

ATTACHMENT 1

UPPER PENITENCIA CREEK
DRAFT PROJECT STUDY PLAN

SAN FRANCISCO DISTRICT
U. S. ARMY CORPS OF ENGINEERS

JULY 1995

UPPER PENITENCIA CREEK
SANTA CLARA COUNTY, CALIFORNIA
DRAFT FEASIBILITY STUDY PROJECT STUDY PLAN

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UPPER PENITENCIA CREEK
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1.0 PURPOSE OF THE PROJECT STUDY PLAN

1.1 Major Components

The Project Study Plan (PSP), formerly Initial Project Management Plan, outlines the program for the conduct and management of the Feasibility Phase for the Upper Penitencia Creek Flood Damage Reduction Study. The major components of the PSP are:

1.1.1 Study Scope

The study scope describes the objective of the Feasibility Study and identifies the activities currently viewed as required to complete it. The major planning phases are identified in this section.

1.1.2 Study Implementation Strategy

Implementation strategy identifies the roles and organizational responsibility of the study participants. Included are the San Francisco District elements, as well as those of the non-Federal sponsor, the Santa Clara Valley Water District (SCVWD).

1.1.3 Study Cost Estimate

The estimated Feasibility Study costs are identified in terms of PB6 categories, with detailed activity descriptions and associated costs provided.

1.1.4 Study Schedule

A schedule for the Feasibility Phase is provided herein. Also provided is a list of the Corps' South Pacific Division (CESPD) milestones for the Feasibility Phase.

1.1.5 Date of Applicable Regulations

This identifies the source of the guidance followed in development of this PSP.

1.2 Objective

This PSP serves as the basis for assigning the Feasibility Study activities and establishing the value of in-kind contributions by the non-Federal sponsor in completing the activities. The objective of this PSP is to provide for orderly and systematic compilation of data and coordination

between the non-Federal sponsor and others required in the planning and decision making processes. Inherent in the PSP, is flexibility, due to an iterative process with continuous public involvement in order to achieve solutions to the Upper Penitencia Creek flood control problems and needs. Public concerns and preferences will be considered continually and analyzed during the refining of the alternative solutions and in the evaluation of their impacts.

1.3 Resolutions and Commitments

1.3.1 Economics

a. NED Land Costs. The economic value of all the lands required for the project will be used in assessing the NED plan. For purposes of the NED analysis, consideration will be given to Real Estate evaluations. This is consistent with CESPD guidance in a CESPD-PD-P Memorandum dated 13 Oct 93, that "the economic value of all the lands required for the project will be equal to the market value."

b. Future Development Benefits. Existing vacant land in the 100-year floodplain, which will become developable with a 100-year level of protection project, may be an additional potential benefit category for the with-project condition.

c. Uneconomic Remnants. There is no basis in law or Corps regulation which allows us to reduce total project cost and to reduce credit given the sponsor in an amount equal to revenues received from the disposition of uneconomic remnants (lands and structures).

d. Approval. An Economic Analysis will be submitted to South Pacific Division and forwarded to HQUSACE for approval. At a minimum, the following will be included in the economic analysis: 1) Sampling procedure for inventory of properties, 2) Methodology for evaluation of building contents, 3) Procedure to determine depth damage curves, 4) Procedure to determine Average Annual Damages

1.3.2 Risk-based analysis:

San Francisco District will develop and present a strategy for the application of risk-based analysis to this study. This strategy will include a specific risk-based analysis model and procedure that would be appropriate for this study. In addition, CESPN will address FEMA requirements and compatibility with the Coyote Creek project. The Risk-Based Analysis will be submitted to South Pacific Division and forwarded to HQUSACE for approval.

1.4 Unresolved Issues

1.4.1 NED Land Cost

In reference to paragraph 1.3.1a above, when determining the NED land cost, the specifics of making adjustments, if necessary, between the Real

Estate and the Economic land values should be coordinated between the appropriate District elements.

2.0 STUDY AUTHORIZATION AND STATUS

2.1 Authorization

The authorization for the Upper Penitencia Creek Reconnaissance Study is found in Section 4 of the 1941 Flood Control Act (PL 78-534), which authorized a preliminary examination and survey of the Coyote River, its tributaries and adjacent streams. Upper Penitencia Creek is a tributary to Coyote River.

2.2 Reconnaissance Report Conclusions

The purpose of a reconnaissance report is to document the results of a reconnaissance study, determine whether the planning should proceed into a feasibility phase, determine the need for an EIS, estimate the time and costs for the feasibility phase and assess the level of interest and support of non-Federal parties in potential solutions that might be identified. The Upper Penitencia Creek Reconnaissance Report (July, 1995) is submitted to CESPD herewith. The Reconnaissance Report concluded that there is a potential solution to the existing flooding problems which is feasible from engineering and environmental perspectives, and which also is likely to have a Federal interest. The solution included a channel modification and bypass plan that would provide a 100-year level of protection. It was determined that planning should proceed into the Feasibility Phase and that an Environmental Impact Statement would be required for the Feasibility Study.

2.3 Non-Federal Sponsor Support

The Reconnaissance Report included a letter of intent from the non-Federal sponsor (enter date here) in which a willingness to cost-share in the Feasibility Study was expressed (attached as Appendix B).

3.0 STUDY AREA DESCRIPTION

3.1 Study Location

The study area includes approximately three square miles of the Upper Penitencia Creek watershed, which lies midway between the cities of San Jose and Milpitas. Upper Penitencia Creek flows through this urban portion of the watershed before emptying into Coyote Creek, which eventually empties into the San Francisco Bay.

3.2 Previous Studies and Projects

Other than the Upper Penitencia Creek Reconnaissance study, there are no other Corps studies or projects within the study area.

4.0 STUDY SCOPE

4.1 General

The purpose of the Feasibility Study is to ensure the timely and economical completion of a quality report that is expected to recommend an implementable solution to the identified flooding problems that is sound in engineering principles, economically justified and politically and environmentally acceptable. The Feasibility Report should be a complete decision document that presents the results of the Reconnaissance and Feasibility studies. The report will: 1) provide a complete presentation of study results and findings including those developed in the Reconnaissance Study, 2) indicate compliance with applicable statutes, executive orders and polices, and 3) provide a sound basis for decision makers to judge the recommended solution.

The scope of the Feasibility Study will involve an in-depth examination and refinement of the floodplain modification/bypass channel alternatives investigated during the Reconnaissance Study. Detailed development of the alternatives will be undertaken using refined design criteria and construction materials in order to facilitate the recommendation of one plan which will meet the flood control requirements of the non-Federal sponsor and the planning objectives of the Federal Government. This recommended plan will additionally be refined in terms of design, cost estimation, economics, environmental documentation and cost-sharing arrangements. These refinements to the recommended plan will be finalized during the Feasibility Study and can then be used for project authorization and carried forward to the Pre-construction Engineering and Design phase.

In accordance with Section 905 of the Water Resources Development Act of 1986, a nonstructural alternative to the recommended plan will be described if the recommended plan does not have significant nonstructural features.

4.2 Study Phases

The Feasibility Study strategy involves implementation of five study phases which are described below. The total estimated cost for the Feasibility Study is $ 2,139,000.

4.2.1 Phase One: Development of Without-Project Condition

The Feasibility Study will be initiated with the signing of a Feasibility Study Cost Sharing Agreement in October 1995. Phase One will include a series of public workshops to be held in San Jose in January 1996. At least one meeting will be held with the Evergreen Resource Conservation District.

Phase One will include reviewing the extent of the flood problem and establishing the existing and most probable future conditions of the study area assuming a Federal project is not implemented. The without project condition will be identified. Work activities will include additional gathering of information on the physical, environmental and geotechnical

characteristics of the study and project areas. The information contained in the Reconnaissance Report will be reviewed from the viewpoint of adequacy for formulation and decision making purposes, and determinations will be made as to the investigations required to update and/or develop the information needed for the remainder of the Feasibility Study.

Phase One will culminate with an F3 Milestone conference. The without-project condition, a preliminary array of alternative plans, including the Locally Preferred Plan (LPP) will be presented at this conference. A preliminary economic analysis, socioeconomic impacts, and construction cost estimates will be presented.

4.2.2 Phase Two: Plan Selection

Phase Two will involve detailed plan evaluation to determine the Federal interest in the alternative plans based on Federal laws, policies and local interests. The alternative plans will also be evaluated based on the economics and environmental impacts of the plans studied.

4.2.3 Phase Three: Detailed Evaluation of the Selected Plan

The objective of Phase Three is the selection, design and recommendation of a plan for construction. The National Economic Development (NED) plan will be identified during this phase, and it will be formulated to include the application of risk-based analysis and the development of a mitigation plan and cost estimate. The NED plan will be an optimized plan, which includes both a minimization of the project first costs, a maximization of the benefits, and community acceptability. Activities in this phase will involve detailed design and evaluation of both the NED plan and the LPP or recommended plan for construction. It is also during this phase that the non-Federal sponsor will prepare a financing plan and statement of ability to pay, i.e., Institutional Studies.

Phase Three will culminate with an F4 Milestone conference. Alternative design plans will be evaluated and presented at the conference along with their construction first costs and benefits. Based on CESPN's evaluation, the SCVWD and CESPN will select the alternatives to be carried forward for further refinement in project design. The end of Phase Three signals the end of the plan formulation process and the beginning of the report preparation phase.

4.2.4 Phase Four: Draft Report Preparation

Phase Four involves preparing the draft Feasibility Report and Environmental Impact Statement, and holding the Feasibility Technical Review Conference and Feasibility Resolution Conference (FRC). It is during Phase Four that the Project Guidance Memorandum (PGM) is prepared following the FRC and submitted to CESPD by HQUSACE. A public review period will be initiated following the review and clearance of the Report/Environmental Impact Statement (EIS) by CESPD. The Feasibility Report will have an Engineering Appendix, consisting of geotechnical analysis, HTRW, design, engineering, and detailed cost estimates with discussion of assumptions, EIS/Report and

economic appendix documents. Reproduction of plates and written text would be performed at this time. Also during this time the preliminary draft Project Cooperation Agreement (PCA) will be prepared. The non-Federal Sponsor will be required to furnish a letter of intent indicating their willingness to cooperate in the project and provide the local assurances in accordance with the draft PCA.

The draft Feasibility Report and EIS/Report will be reviewed by CESPN and SCVWD and the Study Management Team before transmittal to CESPD.

4.2.5 Phase Five: Final Report Preparation

The last phase of the study involves following guidance contained in the above mentioned PGM, and making additions and/or revisions necessary to prepare the final Feasibility Report/EIS. The non-Federal sponsor will be afforded the opportunity to participate in site visits, conferences, and any additional significant rewriting, documentation, analysis, or reformulation as a result of Washington-level review. A "Review Support" work item of $50,000, to cover the SCVWD's and CESPN's expenditures for any such activities following the submission of the Final Feasibility Report/EIS to HQUSACE has been included in this PSP. Should costs be incurred beyond the Review Support, the FCSA will be modified to provide for 50-50 sharing of any additional costs. Any costs relating to the Feasibility Report that are incurred following completion of the Feasibility Phase will be 100 percent Federal. The total estimated cost for the Feasibility Study by phase is presented in Section 6.2 of this document. The Feasibility Study Period will conclude with the issuance of the Division Engineer's Public Notice.

4.2.6 Funding Schedule By Fiscal Year

The Local Sponsor's and Government's funding schedule by fiscal year (i.e., 1 October to 30 September) for execution of the study is:

Fiscal Year	Federal Funds	Local Funds	In-Kind Credit	Total
1996	$410,000	$260,000	$150,000	$820,000
1997	$360,500	$270,500	$ 90,000	$721,000
1998	$259,000	$142,700	$146,300	$548,000
1999	$ 40,000	$ 0	$ 10,000	$ 50,000
Total	$1,069,500	$673,200	$396,300	$2,139,000

5.0 STUDY IMPLEMENTATION STRATEGY

5.1 General

The implementation strategy for the Feasibility Study involves identifying the Federal and non-Federal parties who will manage and control the study, and the departments who will execute the study's technical tasks. The CESPD milestone system will ensure that CESPN effectively reports the study progress and communicates the major accomplishments to CESPD.

The following discusses the roles and organizational responsibilities of the study participants.

5.2 Study Management

5.2.1 Executive Committee

Overall study management is the responsibility of the Executive Committee. Corps membership on this Committee consists of the District Commander, the Deputy District Engineer for Project Management, and the Chief, Planning/Engineering Division. The non-Federal sponsor membership on this Committee consists of the Santa Clara Valley Water District General Manager, the Assistant General Manager for Flood Control, and the Supervising Engineer, Flood Control Planning Division. The Executive Committee is co-chaired by the CESPN Commander and the SCVWD General Manager. This Committee is responsible for resolving any disputes that arise during the study, as well as, providing study direction.

5.2.2 Study Management Team

To provide for consistent and effective communication and implementation of the PSP, the Executive Committee appoints representatives to serve on the Study Management Team. The Study Management Team consists of personnel selected by CESPN and SCVWD. The responsibility of the team is to execute the required study tasks as described in this PSP and comply with the FCSA. The Study Management Team will coordinate all matters relating to the execution of the study and compliance with the cost-sharing agreement, including cost estimates, schedules, execution of work elements, financial transactions and recommendations to the Executive Committee for terminations, suspensions, or amendments to the agreement. The Study Management Team will act independently in the performance of their respective functions under the agreement, and neither party is considered the officer, agent, or employee of the other.

5.2.3 Study Managers

The Federal and non-Federal study managers will maintain books, records, documents, and other evidence pertaining to study costs and expenses incurred pursuant to the cost sharing agreement to the extent and in such detail as will properly reflect total study costs. The Federal and non-Federal sponsor study managers will be responsible for the management of their respective tasks, budgets, and schedules. All books, records, documents and other evidence pertaining to study costs and expenses shall be kept in such a form and in such a way that detailed cost records shall be readily available in the event of a final audit of project costs following project construction.

5.3 Federal and Non-Federal Organizational Responsibility

This section presents an overview of the study responsibilities by organization element within CESPN and the SCVWD.

5.3.1 Corps Project Management Office

The San Francisco District's Life Cycle Project Management (LCPM) system is headed by the Deputy District Engineer for Project Management (DDE(PM)). The DDE(PM) is the senior project management position in the District and is responsible for implementation of the LCPM system and accomplishment of LCPM objectives for the Upper Penitencia Creek Flood Damage Reduction General Investigation.

5.3.2 Corps Team Project Manager

Studies and projects will be managed by the Project Manager (PM) for the overall schedule and budget. The project manager is responsible for overall management of the project, upward reporting, development of the Project Study Plan (PSP), coordination with the sponsor for the preparation of the Project Cooperation Agreement (PCA), and execution of the project from conception through construction and to acceptance by the sponsor. A technical manager will be assigned to a District element, who has lead responsibility for the current study phase. In the case of CESPN, the District element would be the Planning/Engineering Division. As the study or project proceeds through the planning, design, and construction phases, the technical manager authority transfers from the technical manager to the design manager, and eventually to the construction manager.

The PM is responsible for managing the project scope, quality, cost, budget, and schedule; facilitating actions to resolve potential or existing issues; and reporting the status of the study to higher authorities and the non-Federal sponsor. The PM serves as the principle responsible authority as well as the primary point of contact for study coordination between the non-Federal sponsor and the Corps and must assure a mutual understanding of the responsibilities of each party.

For the current Feasibility Study, the technical manager will be responsible for incorporating pertinent information into the main report text using the materials provided by the support elements (Planning Branch and Engineering Branch), printing the report, coordinating with the non-Federal sponsor on the cost-sharing agreement and arranging the in-house review.

The PM is the recognized leader of the study, whose duties include the following:

(1) obtain staffing, cost, schedule, and task description input from participating District elements and the non-Federal sponsor; integrate input to develop a draft Project Study Plan (PSP) for the recommended project. The PM will amend the PSP to reflect Feasibility Resolution Conference (FRC) comments.

(2) designate appropriate allocation of project funds to each District element in accordance with the standard code of accounts, based on data from the PSP.

(3) monitor actual obligations and expenditures to ensure compliance with the PSP, proper distribution of obligations and expenditures among the standard code of accounts, and effective utilization of Federal and non-Federal funds.

(4) work with designated team members of the District's other elements to assure early identification of study related issues which may impact scope, quality, cost, budget, and schedule, and either facilitate resolution or elevate them to the appropriate decision-making level.

(5) manage study schedule and cost, making and/or recommending necessary adjustments based upon changes and performance; develop forecasted schedules and cost estimates.

(6) prepare Study Schedule and Cost Change Requests or receive such requests from other elements in the District or the non-Federal sponsor. The PM will evaluate and take action on those requests received. The PM will maintain a complete study history of schedule and cost changes and will modify the PSP in accordance with approved schedule and cost changes.

(7) prepare required LCPM reports.

(8) update baseline estimates and develop forecasts.

(9) review and endorse all study documents for consistency with the FCSA and the draft PSP prior to submission to the non-Federal sponsor, higher authority, or outside agencies.

(10) prepare annual budget, and other programming and reprogramming documents prior to submittal to the DDE(PM).

(11) serve as the focal point of contact with the non-Federal sponsor on study issues. The PM will ensure non-Federal sponsor understanding of local cost-sharing requirements for study execution, regularly update the non-Federal sponsor on study progress, review and monitor the non-Federal Sponsor's compliance with commitments, participate in resolution of technical and policy issues with the non-Federal sponsor, and coordinate Study Schedule and Cost Change Requests.

(12) lead the District elements in the preparation and negotiation of a preliminary Project Cooperation Agreement (PCA).

(13) control costs and schedules through established approval authorities during the Feasibility Phase, including review of technical documents, and make periodic site visits, as appropriate.

(14) assure that environmental commitments are incorporated into the study.

(15) participate in feasibility technical review, and other review conferences, and approve memoranda for the record thereof.

(16) serve on selection boards for Architectural/Engineering (A/E) and other contracts to accomplish study tasks.

5.3.3 Corps Technical Management Team Members

The Upper Penitencia Creek Feasibility Study management team composition will be the Technical Manager (TM) and designated representatives from Planning/Engineering Division, to include Planning Branch and Engineering Branch as well as representatives from Constructions/Operations Division, Procurement and Supply Division, Office of Counsel, Resource Management Office, Public Affairs Office, Real Estate Division (CESPK), and others as appropriate. Individual team members are selected by the District element chief at the request, and with the concurrence of, the DDE(PM). The TM and other members of the team remain under the supervisory and administrative control of their District element chiefs and may be assigned other technical duties and responsibilities at the discretion of their supervisor.

Planning/Engineering Division

The Planning/Engineering Division is composed of three branches (Planning Branch, Engineering Branch and Economics Branch). The Division and its three branches provide the management overview of all technical activities involved in preparation of the Upper Penitencia Creek Feasibility Study. The Division oversees distribution and utilization of resources required to accomplish these activities including funding and District manpower. The Division assures technical adequacy of all efforts leading to the Feasibility Report and Environmental Impact Statement (EIS). The Division also manages the current budget year study execution.

Planning Branch

The Planning Branch is composed of three sections (Environmental Science Section, Environmental Planning Section, and Plan Formulation Section). The branch chief is responsible for the management overview of all technical activities within the branch and provides guidance based on interpretation of environmental and planning legislation and related agency guidelines.

Engineering Branch

The Engineering Branch is composed of four sections (Civil Design Section, Geotechnical Section, Estimates & Specification Section and Hydraulics/Coastal Section). The branch chief is responsible for the management overview of all technical activities within the branch and provides guidance based on interpretation of environmental and planning legislation and related agency guidelines. The branch will prepare an Engineering Analysis report to be included in the Feasibility Report.

Economics Branch

The Economics Branch performs site investigations and surveys and conducts research on economic parameters and related concerns. The branch participates in the development of study alternatives and performs economic studies which set forth projections of future economic development. The branch estimates and determines the nature and extent of benefits expected to accrue as a result of alternative flood control improvement plans. The branch prepares the economic portions of the Feasibility Report using a comparison of existing project conditions versus the anticipated economic changes resulting from the proposed project. Specifically for this Feasibility Study, the Economics Branch will perform the Phase Two economic studies and assist the Technical Manager in plan formulation activities. This Branch will also prepare an Economic Analysis Report and Financial Analysis Report to be included in the Feasibility Report Engineering Appendix.

Each of the Planning/Engineering sections below will be responsible for addressing comments made concerning their portion of the Feasibility Report. Incorporation of responses to comments will be the TM's responsibility, and will be coordinated within the Study Management Team.

Environmental Planning Section. The Environmental Planning Section is in charge of the preparation of the Environmental Impact Statement (EIS), consistency determinations for State laws and plans, and Section 404b(1) Evaluation (Clean Water Act). Included are site investigations, site surveys, and research to address project impacts on cultural resources, society, air quality, water quality, vegetation, fish and wildlife (including endangered species), recreation, aesthetics and related concerns. The Section also participates in determining the extent of project mitigation required, is responsible for coordination of the agency and public review of the EIS and participates in public hearings as part of the EIS process.

During the early stages of the Feasibility Study the Section will begin gathering environmental data to supplement the existing baseline information. Coordination with the U.S. Fish and Wildlife Service will be initiated as well. First, the Service will conduct an evaluation of the anadromous fisheries habitat and a survey of migrating adult fish, and later perform a Habitat Evaluation Procedure (HEP) analysis.

During the Feasibility Study, a literature review will be conducted to determine whether any facilities are listed as HTRW sites. This will include Federal, State and additional local agency lists and data bases, such as those maintained by the Environmental Protection Agency (California Environmental Response, Compensation, and Liability Information System), the State of California Office of Permit Assistance (Hazardous Waste and/or Substance Site List), and the City of San Jose Bureau of Fire Emergency (Hazardous Materials Storage Ordinance Program). In addition, a field reconnaissance and review of aerial photos of the entire project area will be conducted. Based upon the results of the literature and aerial photo review, and the field survey, a soil sampling and testing program may be appropriate. The scope of the testing program would be developed during the Feasibility Study.

This Section is also responsible for the mitigation planning. Coordination with the Sacramento District Real Estate Division is vital to the development of the mitigation plan because of the high cost of real estate in the study area.

Environmental Sciences Section. Cultural resources studies, minimally consisting of a review of previous research, and archaeological and historical field surveys, also will be completed by the Section. The Section will be responsible for the social environment study, to be performed either through a professional services contract or in-house.

Plan Formulation Section. The Plan Formulation Section provides guidance on the interpretation and implementation of civil works planning legislation and related Corps regulations, circulars, manuals, and guidance letters. The technical manager also resides in this section and is responsible for preparing the feasibility report.

Civil Design Section. The Civil Design Section provides feasibility level designs and drawings for the flood control improvements and channel modification alternatives and replacement bridges. Basis of design for the recommended plan will be performed by the Civil Design Section. The Section will also prepare design reports, coordinate and compile the Feasibility Report Engineering Analysis Appendix.

Geotechnical Section. The Geotechnical Section coordinates the geotechnical studies, which will be implemented in two phases. Execution of the geotechnical borings is to be performed by contract, while testing is to be done by the Corps' South Pacific Division Laboratory or equivalent facility. The Section would conduct studies relative to soils analysis and foundation design, complete an analysis of the test data and prepare a geotechnical report to be included in the Engineering Analysis Appendix to the Feasibility Report.

Estimates & Specification Section. The Estimates & Specification Section prepares construction cost estimates, including a Micro Computer Aided Cost Estimating System (MCACES) estimate for the NED and LPP plans.

Hydraulics/Coastal Section. The Hydraulics/Coastal Section provides technical staff input on basin hydrology analyses, generates existing and residual flood plains and conducts hydraulic design of the alternatives. The hydrology for the Reconnaissance Report was based on the Soil Conservation Service's "Upper Penitencia Creek Watershed Final Watershed Plan and Environmental Impact Statement/Report" (1990). The Hydraulics/Coastal Section will develop new flood plains which are consistent with Corps standards. Flood plains for the 10-, 50-, and 100-year design events, and the SPF discharge, will be determined, as will residual flood plains. A hydrology and hydraulics report will be prepared to be included in the Engineering Analysis Appendix to the Feasibility Report. All work conducted by this section will be coordinated with the hydrology and hydraulics personnel at CESPN and the SCVWD.

Construction-Operations Division

The Construction-Operations Division exercises staff supervision over Civil Works construction and dredging of waterways. It establishes construction schedules in coordination with District design elements, and develops budget requirements for all operation and maintenance projects. As part of the life cycle project management concept and initiatives to better define the project and its cost, the Construction-Operations Division will be involved in the Feasibility Study planning process to specifically include plan formulation and evaluation with a view toward assessing the constructability and operability of plans.

Contracting Division

The Contracting Division has the responsibility for the administration, preparation, issuance, and opening of the Invitation for Bids and the award of those contracts necessary for the Feasibility Study. Currently the PSP includes contractual needs to conduct the geotechnical investigations, and possibly a social environment study.

Resource Management Office

The Resource Management Office (RMO) serves as the District financial manager and staff management analysis officer in formulating, recommending policies and procedures to assist the District Commander in the accomplishment of the financial District's management and programming responsibilities. In particular, it manages the Support Branch which implements the District's fiscal polices. This branch's tasks include: professional accounting services; certification of availability of funds; performs review and analysis of account balances and trends; performs analyses to determine District overhead rates; and monitors rate of obligations and expenditures as compared to budgets and work schedule. RMO also manages the Mission Branch which prepares District budget submissions and coordinates the setting of the initial current-year funding execution program.

Office of Counsel

The Office of Counsel (OC) reviews the District's planning documents (e.g., Feasibility Report and Environmental Impact Statement) to assure compliance with statutory authority and with environmental laws and polices. Feasibility Cost-Sharing Agreements and Local Cooperation Agreements also are reviewed by the Office of Counsel.

Public Affairs Office

The Public Affairs Office (PAO) conducts the public affairs program with responsibility for developing and providing staff direction involving all public information and community relations activities. PAO supports a comprehensive public involvement program designed to secure public acceptance of the Upper Penitencia Creek Feasibility Study, solicit input from the public, and keep interested parties fully informed as to the study developments at given milestones throughout the study. PAO arranges

interviews, inspection trips and accommodations for visiting government officials. PAO also arranges for District representatives to speak at public meetings and workshops as well as assembles data for and drafts speeches and public presentations as required.

For the Feasibility Study, PAO will assist the non-Federal sponsor and the PM in the implementation of the public involvement program. A public workshop will be held early in the Feasibility Study, designed to receive input and comments from residents and interested parties within the study area. A final public meeting will be held during the public review period for the draft Feasibility Report/EIS.

The PAO will be responsible for development of the public briefing materials and the audio/visual equipment (where necessary) for both the public workshop and the final meeting.

Security and Law Enforcement Office

If any aspect of the study entails accessing classified information, this office supports the processing of uncleared individuals for security clearances. This office also implements procedures to deal with civil disturbances, threats to Corps employees, bomb threats, etc.

Value Engineering Office

The District's Value Engineering Officer is responsible for monitoring all study phases to ensure that any recommended project is ultimately constructed within acceptable engineering standards while minimizing costs.

Sacramento District of the Corps

Real Estate Division. The Appraisal Branch of the Real Estate Division (CESPK) will identify the real property required for project construction, including extent and number of takings in accord with engineering design requirements. The Branch will prepare an estimate of the project real estate acquisition cost for inclusion in the Feasibility Report (i.e., Gross Real Estate Appraisal Report), and acquire temporary rights-of-entry, if needed, for project studies. The Branch will advise the non-Federal sponsor of the relocation assistance benefits and acquisition guidelines required for the project. The Real Estate Division will coordinate with the non-Federal sponsor, and provide the sponsor with real estate documentation for review.

5.3.4 Non-Federal Sponsor Study Management Team Members

The non-Federal sponsor study team members consist of the Flood Control Manager, Division Head of Flood Control Planning and the Project Engineer.

The non-Federal sponsor will be responsible for the topographic survey and mapping, which will be performed during Phase One through a

professional services contract coordinated by the sponsor. The sponsor also will either assist in data gathering or provide review for all of the Phase-One and Phase-Two activities (except Fish and Wildlife Service coordination). The non-Federal sponsor, in addition, will coordinate with the Corps and other agencies in the hydrology and hydraulic design, civil and structural design, cost estimating, environmental, plan evaluation and real estate activities of Phase Two and Phase Three. The sponsor also will provide a financing plan and statement of financial capability. The Phase-Four activities that the sponsor will be involved in include drafting a project cooperation agreement, conducting the final public meeting and reviewing the draft Feasibility Report/EIS. In Phase Five, the non-Federal sponsor will participate in the activities related to the Washington-level review of the report.

The sponsor shall be afforded the opportunity to:

(1) review the monthly Project Executive Summary Reports and provide comments for inclusion into the report prior to the transmitting of the report to higher levels of authority within the Corps.

(2) assist in preparing other documents about the project, including environmental assessments, impact statements and other environmental documents; design memoranda; and plans and specifications.

(3) attend meetings about the project, including Project Review Boards, Issue Resolution Conferences, Technical Resolution Conferences, and meetings of the Washington Level Review Center.

(4) participate in any additional significant rewriting, documentation, analysis, or reformulation of project design memoranda as a result of South Pacific Division and/or Washington level review.

The non-Federal Sponsor understands and accepts that while the Corps will strive for a fair partnership, the relationship between the Corps and the non-Federal sponsor will not always be equal in view of laws, administration policies and professional standards that provide economic opportunities, fix legal responsibilities, protect public safety and otherwise act in the public interest. Examples include Federal environmental requirements, Corps contracting officer responsibilities, cost-sharing and other mandated items of local cooperation. The sponsor has the right to have such conditions clearly explained as they may arise during of life of the project.

6.0 STUDY ACTIVITY DESCRIPTIONS AND COST ESTIMATE

6.1 The following provides a detailed description of the activities to be accomplished during the Feasibility Study by the Corps of Engineers and the Santa Clara Valley Water District. Also, activities to be completed by other Corps elements and other Federal agencies are included. The estimated cost of each activity, and the value of in-kind services that the non-Federal sponsor would receive credit for, are shown. A tabular summary of the costs and in-kind credit is provided at the end of this section.

PB6 ACCT. NO.	ACTIVITY DESCRIPTION	COST

^ Denotes total cost for Feasibility Study work element.
* Denotes credit for non-Federal sponsor in-kind work.

502.01 PUBLIC INVOLVEMENT $ 15,000^
$ 8,900*

Prepare public announcements, arrange accommodations, invite the public and prepare public briefing materials. Conduct a public workshop at the beginning of the Feasibility Study, and a final public meeting after the draft Feasibility Report & EIS has been distributed.

Public Workshops and Meetings
The non-Federal sponsor will arrange accommodations, invite the public and assist in the printing and distribution of the public announcements and provide a meeting location for both the meetings. The Corps will prepare meeting materials and coordinate agency attendance.

502.02 INSTITUTIONAL STUDIES $ 12,000^
$ 10,500*

The non-Federal sponsor will prepare a financing plan and an accompanying statement of financial capability. The financing plan should include a schedule of the sources and uses of non-Federal funds during and after construction, and set forth information on the sources of local government income, current local indebtedness, operating expenses, expenditures, trends in assessed values, and other financial data. The statement of financial capability should provide evidence of the sponsor's authority to utilize the identified sources of income. Based on the information provided by the non-Federal sponsor, the Corps will prepare an assessment of the non-Federal sponsor's financial capability.

502.03 SOCIAL ENVIRONMENT STUDY $ 20,000^
$ 5,000*

The Corps will be responsible for conducting a social impact assessment. The assessment will include research of the affected community, interviews, and preparation of necessary reports. The assessment will supplement the public involvement activities for the study and comply with Executive Order 12898 (Environmental Justice).

The non-Federal sponsor will obtain information on the residential community to assist the Corps in scoping the work for the impact assessment, and also

review the reports. The Corps will be responsible for conducting the assessment and preparing the documentation.

502.04 CULTURAL RESOURCES STUDY $ 25,000^
$ 5,000*

Conduct a cultural resources study and comply with National Historic Preservation Act. The study, in accord with the Secretary of the Interior's Standards and Guidelines, will include review of existing information, coordination with local Native American organizations, an archaeological survey and augering of known archaeological sites, and preparation of reports.

The non-Federal sponsor will obtain the existing cultural resources information, provide assistance to the Corps on Native American coordination and on property access for fieldwork, and review all reports and correspondence. The Corps will implement the survey and augering, document sites and study results, and fulfill the Federal responsibilities pursuant to Section 106 of the Historic Preservation Act.

502.05 ENVIRONMENTAL STUDIES $200,000^
Environmental Impact Statement (EIS)/(EIR) $ 20,000*

The Corps will collect environmental data, assist the U. S. Fish and Wildlife Service in their studies and conduct an incremental mitigation analysis. These studies will include appropriate species surveys. The Corps will prepare the draft and final EIS/EIR and public notice, and coordinate the review with Federal and State agencies.

The non-Federal sponsor will provide information on existing environmental conditions, habitat evaluation of the study area and assist the Corps in development of the mitigation measures and preparation of the EIS/EIR.

502.06 FISH AND WILDLIFE STUDIES $ 50,000^

The U.S. Fish and Wildlife Service will evaluate fishery habitat and, in conjunction with the Corps and other agencies, prepare a Habitat Evaluation Procedures (HEP) analysis. Prepare a draft and final Coordination Act Report pursuant to the Fish and Wildlife Coordination Act. The Corps will

arrange transfer of funds to the Service for the above activities.

502.07 ECONOMIC STUDIES $ 85,000^
$ 10,000*

The Corps will conduct a benefit analysis of the study area. Perform economic studies to evaluate flood damages, business and emergency losses, future land use benefits and other benefit categories referred to in the Reconnaissance Study. The Corps will conduct a Risk & Uncertainty Assessment. Prepare an Economic Assessment which will be incorporated into the Feasibility Report. The non-Federal sponsor will supply a list of all commercial and residential properties, based on appropriate assessor's data, and data on public properties (e.g., schools, fire stations, libraries, etc.) located within the floodplain (the Economic Inventory). The sponsor will provide current replacement values for structures selected from the sample of properties developed by the Corps, and collect and compile for the Corps information on business activities in the floodplain and immediate vicinity.

502.08 SURVEYING AND MAPPING $ 100,000^
$ 100,000*

The non-Federal sponsor will be responsible for acquiring two master sets of orthographic photos(1" = 200' and 2-foot contour interval) for floodplain mapping, and two master sets (1" = 50' and one-foot contour interval) for hydraulic and civil design. The sponsor will develop top-of-bank profiles for both sides of the Upper Penitencia Creek that are within the study area. Profile points are to be taken at 100-foot intervals, with additional profiles to be taken at significant structural points and changes in grade (e.g., culverts, bridge abutments).

502.09 HYDROLOGY AND HYDRAULIC INVESTIGATION

Hydrology $ 72,000^

The Corps will conduct site visits and review previous reports/work. A discharge versus frequency curve will be developed at one index location for Upper Penitencia Creek. Unit hydrographs will be developed and combined with statistical/historical rainfall to generate 25-, 50-, 100-, and 200- or 500-year storm hydrographs. An interior drainage analysis will be conducted to size appropriate

drainage facilities. Findings will be presented in a hydrologic engineering office report for the Engineering Appendix.

Sediment Study $ 50,000

A basin sediment study will be conducted to verify existing work and to determine the need for any sediment control structures. Tasks will include field investigations and bed material sampling, sediment production and delivery estimates for average annual and single event storms, and reach averaged sediment transport capacities for various flood magnitudes.

Hydraulics $ 78,000^
$ 5,000*

With and without project floodplains will be developed for 25-, 50-, 100-, and 200- or 500-year storm conditions using up-to-date topographic information. Design work will include sizing of floodwalls, levees, culverts and by-pass channels, and will address flood proofing of structures. A risk-based analysis will be conducted to optimize proposed improvements. Findings will be presented in a Hydrology and Hydraulics appendix. The non-Federal sponsor will obtain new data and coordinate with the Corps and other agencies.

502.10 GEOTECHNICAL DESIGN AND ANALYSIS $345,000^
$ 5,000*

The Corps will be responsible for the conduct of a two-phase geotechnical investigation (A/E or professional services contract), to include the testing of samples (CESPD laboratory or equivalent). This work will incorporate the data obtained by the NRCS in their 1990 report. Phase I drilling will consist of no more than 15 borings on the east bank of the river, and up to 15 more borings spread along the west bank and at each bridge crossing. Phase II drilling will not exceed 10 borings to supplement data from Phase I. The Corps will prepare a Geotechnical Report for inclusion in the Engineering Appendix. The cost includes contract administration and monitoring.

The non-Federal sponsor will secure rights-of-entry for the drilling, provide locations of utilities, review the Geotechnical Report and coordinate with the Corps and other agencies.

502.11 DESIGN AND COST ESTIMATES $170,000^

Develop civil design ($ 40,000), cost estimates ($20,000), and quantities ($10,000) for the channel work on both alternative plans, including basis for design and drafting ($20,000). Develop design ($40,000) and cost estimates ($20,000), including basis for design and drafting ($20,000) for the modified floodplain for both alternative plans. Compile written report and drawings for inclusion in the Feasibility Report and the Engineering Appendix.

502.12 REAL ESTATE $50,000^

The Real Estate Division (CESPK) will identify the real property required for project construction, prepare an estimate of the project real estate acquisition cost, acquire any needed temporary access rights, and advise the non-Federal sponsor of the relocation assistance benefits and acquisition guidelines required for the project.

502.13 STUDY MANAGEMENT $139,000^
$ 30,000*

The Corps and the non-Federal sponsor will perform study management needed to complete their work items during the Feasibility Study and the writing of the Feasibility Report. This includes management of study tasks, study scheduling, budget preparation, correspondence preparation, coordination with the concerned public.

Study Team Meetings $ 38,000^
The Corps and non-Federal sponsor study team $ 19,000*
members will equally participate in at least six study progress meetings which will be held at approximate four-month intervals during the study.

502.14 PLAN FORMULATION/EVALUATION/REVIEW $ 30,000^
The Corps and non-Federal sponsor study team $ 6,000*
members will work jointly in performing in-house review and screening of the alternative plans' development and refinement.

502.15 REPORT PREPARATION AND PRINTING $ 55,000^

The Corps will compile data from the study team members and write a draft Feasibility Study Report, which will integrate an Environmental Impact Statement, and assemble the Engineering Appendix. Prepare a final Report once the team members have addressed draft report comments. The Corps will be responsible for printing of the draft and final reports.

502.16 PREPARE PROJECT MANAGEMENT PLAN $ 50,000^
$ 3,000*

The Project Management Plan (PMP) will be developed which will include the scope, schedule, budget, and performance measurement criteria including milestones. The PMP will be submitted for review at the FRC (Milestone F5A).

502.16 WASHINGTON LEVEL PROCESSING-REVIEW SUPPORT $ 50,000^
$ 10,000*

The Corps will support the Washington level review process from the signing of the report through the ASA(CW)'s request to OMB. These tasks could include answering comments, attending Washington level meetings (including the non-Federal sponsor), and minor report revisions.

502.20 HAZARDOUS MATERIALS STUDY $ 65,000^
The Corps will provide assistance to the non-Federal Sponsor in the review and coordination of the hazardous material study.

PHASE I $ 10,000*

The non-Federal Sponsor will be responsible for

1) Conduct a literature review and field reconnaissance.

2) Identifying potential sources of contamination within ½ mile radius of the project alignment.

3) Performing a property acquisition investigation.

4) Preparing a report summarizing the findings and recommendations for additional work as applicable. This work will incorporate the information obtained during the Reconnaissance phase.

PHASE II $ 35,000*

The non-Federal Sponsor will be responsible for:

1) Review of Phase I findings.

2) Developing detailed work plan for in-depth field investigation to assess and monitor the extent of subsurface contamination at all identified sites.

3) Implementing the work as proposed in the work plan.

4) Preparing a report of findings, provide professional opinions on the extent of subsurface contamination along the project alignment and potential impacts to the proposed project, and recommend remedial alternatives for hazardous materials encountered during construction.

502.31	PROJECT/PROGRAM MANAGEMENT Prepare budget documents, Congressional justifications, and perform financial tracking and record keeping.	$250,000^
502.31	TECHNICAL REVIEW Perform independent review of environmental, economic, engineering, real estate, and policy elements of Study prior to Milestones F3, F4, F5, F5A, F6, and F8.	$200,000^ $100,000*
	ESTIMATED TOTAL FEASIBILITY PHASE COST	**$2,139,000**

6.2 Summary of Feasibility Costs

UPPER PENITENCIA CREEK
FEASIBILITY COST ESTIMATE SUMMARY

	Total Fed and Non-Fed	Non-Fed Credit
Public Meetings	$ 15,000	$ 8,900
Institutional Studies	$ 12,000	$ 10,500
Social Environment Study	$ 20,000	$ 5,000
Cultural Resources Studies	$ 25,000	$ 5,000
Environmental Studies	$200,000	$ 20,000
Fish and Wildlife Studies	$ 50,000	$0
Economic Studies	$ 75,000	$ 15,000
Survey and Mapping	$100,000	$100,000
Hydrology	$ 72,000	$0
Sediment Study	$50,000	$0
Hydraulics	$ 78,000	$ 5,000
Geotechnical Investigation	$345,000	$ 5,000
Design and Cost Estimates	$170,000	$0
Real Estate Cost Estimate	$ 50,000	$0
Study Management	$139,000	$30,000
Study Team Meetings	$ 38,000	$ 19,000
Plan Formulation/Evaluation/Review	$ 30,000	$ 6,000
Report Preparation and Printing	$ 55,000	$0
Project Management Plan Preparation	$ 50,000	$ 3,000
Washington Level Review Support	$ 50,000	$ 10,000
Hazardous Materials Study	$ 65,000	$ 45,000
Project/Program Management	$250,000	$0
Technical Review	$200,000	$ 100,000
Totals	**$2,139,000**	**$ 396,300**

7.0 STUDY SCHEDULE

A detailed schedule of the Feasibility Phase has been prepared using the critical path method; it is attached as Appendix A. The following is a list of significant milestones from the detailed schedule, based on the Engineer Regulation (ER) 5-7-1(FR), for project management.

P R O J E C T M I L E S T O N E S C H E D U L E

CESPN PROJECT: UPPER PENITENCIA CREEK

#	M I L E S T O N E S	BASELINE SCHEDULE	APPROVED SCHEDULE	CURRENT SCHEDULE	ACTUAL SCHEDULE
050	PSP FOR FEAS APPROVED	30 SEP 95			
051	FNL RECON RPT APPROVED (R7)	30 SEP 95			
052	HQUSACE CERTIFICATION	30 SEP 96			
060	FCSA SIGNED	15 OCT 95			
100	FEAS STUDY INITIATION (F1)	30 OCT 95			
101	FEAS PUBLIC WORKSHOP (F2)	15 JAN 96			
102	FEAS CONFERENCE #1 (F3)	15 NOV 96			
103	FEAS CONFERENCE #2 (F4)	15 AUG 97			
104	DRAFT REPORT TO CESPD (F5)	15 JAN 98			
140	FEAS RES CONFERENCE (F5A)	28 FEB 98			
201	RECOMMEND PED INITIATION	5 MAR 98			
161	FIELD LEVEL COORD (F6)	30 MAY 98			
162	FINAL PUBLIC MEETING (F7)	30 JUN 98			
163	FINAL FEAS RPT TO CESPD (F8)	15 AUG 98			
170	DIV ENGINEERS NOTICE (F9)	30 OCT 98			
200	INITIATION OF PED	14 NOV 98			
310	FILING OF FEIS	30 JAN 99			
320	SIGN RECORD OF DECISION	15 OCT 99			
330	RPT OF CHIEF OF ENGINEERS	30 OCT 99			
340	TRANSMIT RPT TO CONGRESS	20 DEC 99			

8.0 DATE OF APPLICABLE REGULATIONS

The requirement to prepare a PSP, and the specified content of it, are contained in the following regulations.

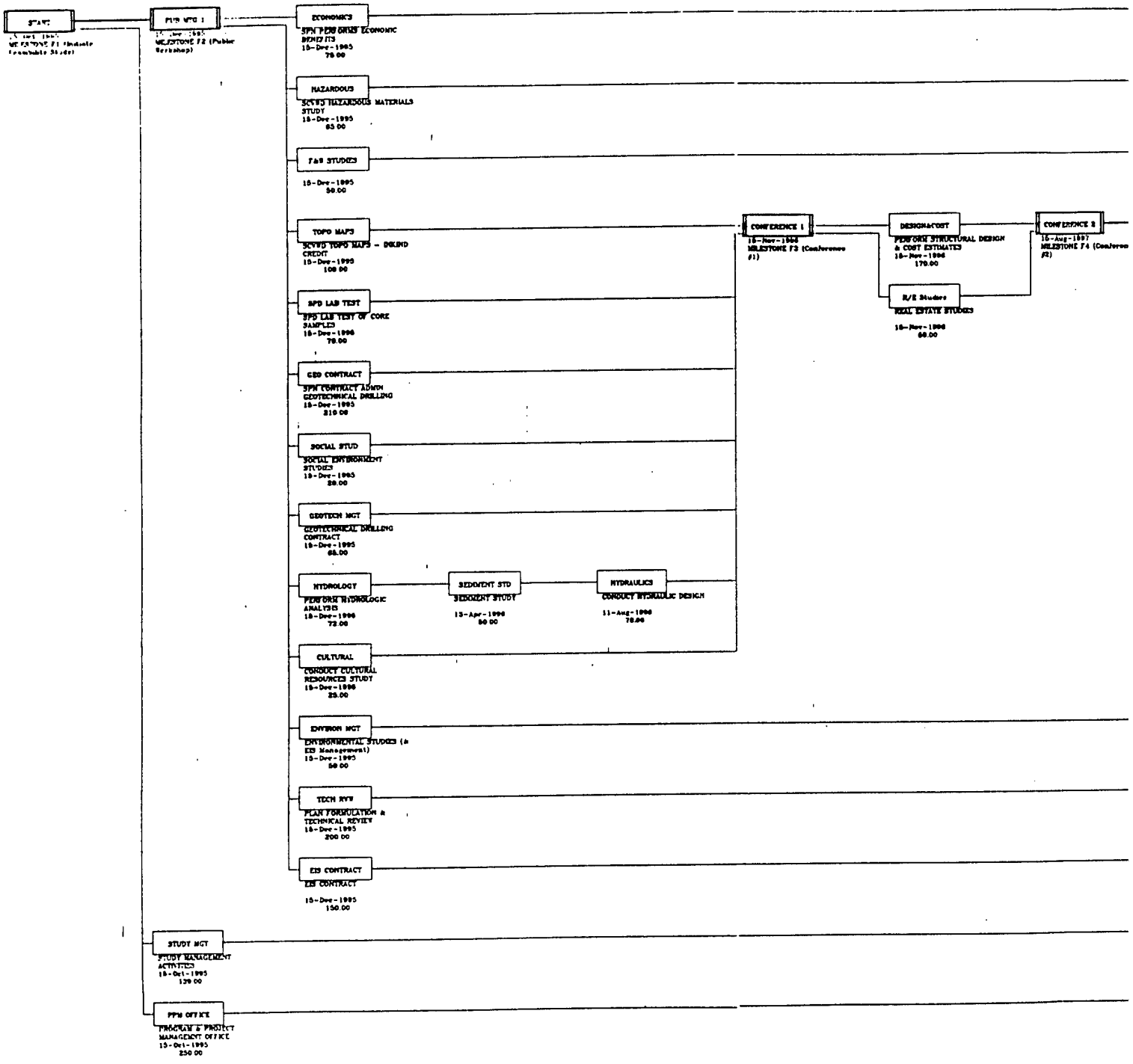
(1) Engineering Regulation No. 5-7-1 (FR): Project Management (dated 30 September 1992).

(2) Engineering Regulation No. 1105-2-100: Planning Guidance for Conducting Civil Works Planning Studies (dated 28 December 1990).

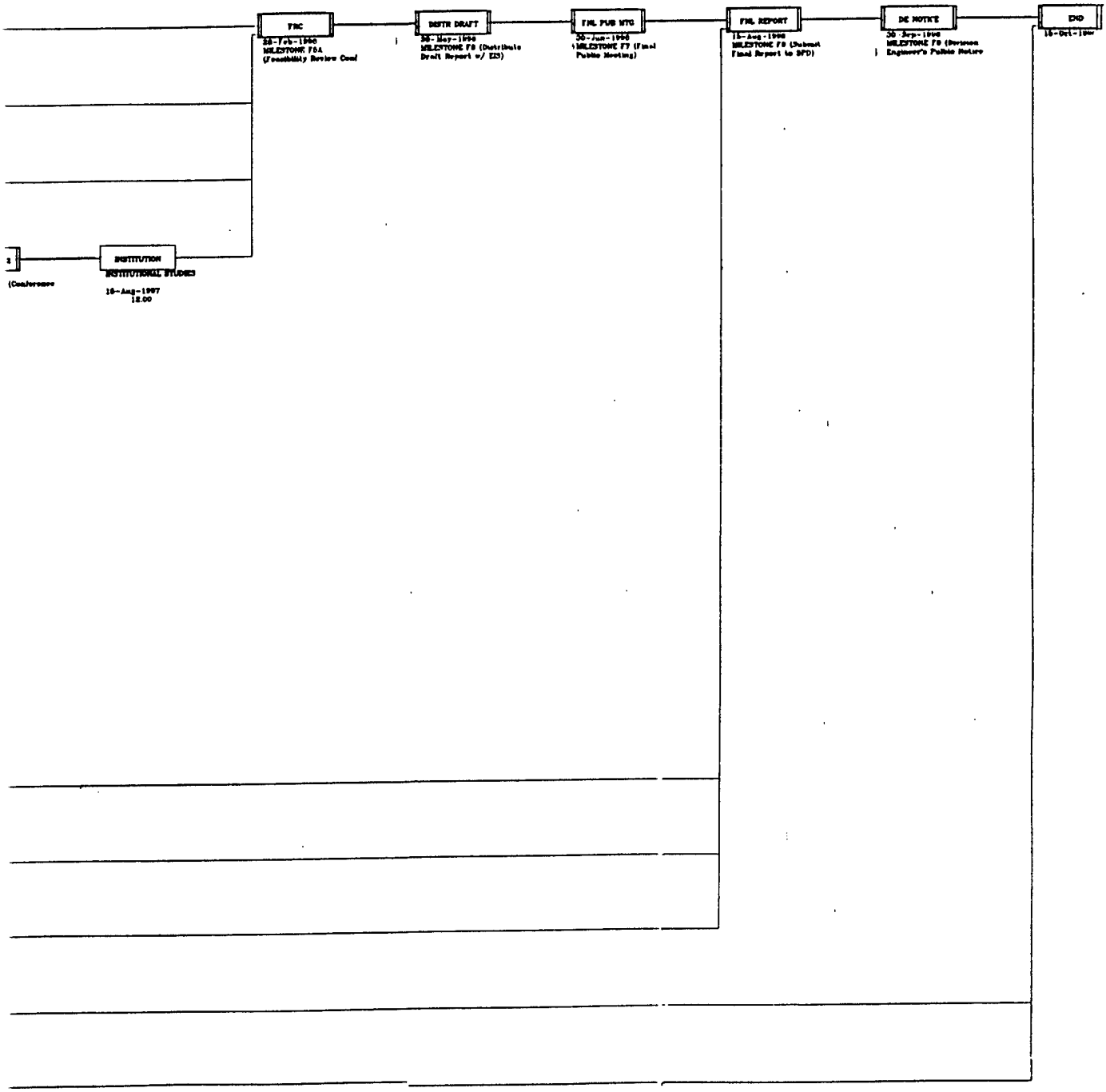
(3) South Pacific Division Regulation No. 5-2-1: Life Cycle Project Management System, Appendix H (dated 21 November 1989).

(4) Engineering Circular No. 1110-2-208: Preparation and Use of Project Study Plan (dated 23 December 1994), transmitting interim guidance on the development and use of Project Study Plans (PSP) (formerly Initial Project Management Plan) to guide the feasibility study process.

PERT Chart


START
PUB MTG 1
ECONOMICS
SPN PERF GNRL ECONOMIC BENEFITS
18-Dec-1995
75.00
HAZARDOUS
SCVWD HAZARDOUS MATERIALS STUDY
18-Dec-1995
65.00
F&H STUDIES
18-Dec-1995
50.00
TOPO MAPS
SCVWD TOPO MAPS - INKIND CREDIT
15-Dec-1995
100.00
SPD LAB TEST
SPD LAB TEST OF CORE SAMPLES
18-Dec-1996
70.00
GEO CONTRACT
SPN CONTRACT ADMIN GEOTECHNICAL DRILLING
18-Dec-1995
210.00
SOCIAL STUD
SOCIAL ENVIRONMENT STUDIES
19-Dec-1995
20.00
GEOTECH MGT
GEOTECHNICAL DRILLING CONTRACT
18-Dec-1995
60.00
HYDROLOGY
PERFORM HYDROLOGIC ANALYSIS
18-Dec-1996
72.00
SEDIMENT STD
SEDIMENT STUDY
13-Apr-1998
80.00
HYDRAULICS
CONDUCT HYDRAULIC DESIGN
11-Aug-1998
70.00
CULTURAL
CONDUCT CULTURAL RESOURCES STUDY
18-Dec-1996
25.00
ENVIRON MGT
ENVIRONMENTAL STUDIES (& EIS Management)
18-Dec-1995
50.00
TECH RVW
PLAN FORMULATION & TECHNICAL REVIEW
18-Dec-1995
200.00
EIS CONTRACT
EIS CONTRACT
18-Dec-1995
150.00
CONFERENCE 1
18-Nov-1996
MILESTONE F3 (Conference #1)
DESIGN&COST
PERFORM STRUCTURAL DESIGN & COST ESTIMATES
18-Nov-1996
170.00
R/E Studies
REAL ESTATE STUDIES
18-Nov-1996
60.00
CONFERENCE 2
18-Aug-1997
MILESTONE F4 (Conference #2)
STUDY MGT
STUDY MANAGEMENT ACTIVITIES
18-Oct-1995
120.00
PPM OFFICE
PROGRAM & PROJECT MANAGEMENT OFFICE
15-Oct-1995
250.00

. Creek Feasibility Study
ect: AA147



(2)

Santa Clara Valley Water District

5750 ALMADEN EXPRESSWAY
SAN JOSE, CA 95118-3686
TELEPHONE (408) 265-2600
FACSIMILE (408) 266-0271

AN AFFIRMATIVE ACTION EMPLOYER

July 17, 1995

LTC Michael J. Walsh
U.S. Army Corps of Engineers
San Francisco District
211 Main Street
San Francisco, CA 94105-1905

Dear ~~Colonel~~ Michael Walsh:

Subject: Upper Penitencia Creek Feasibility Study

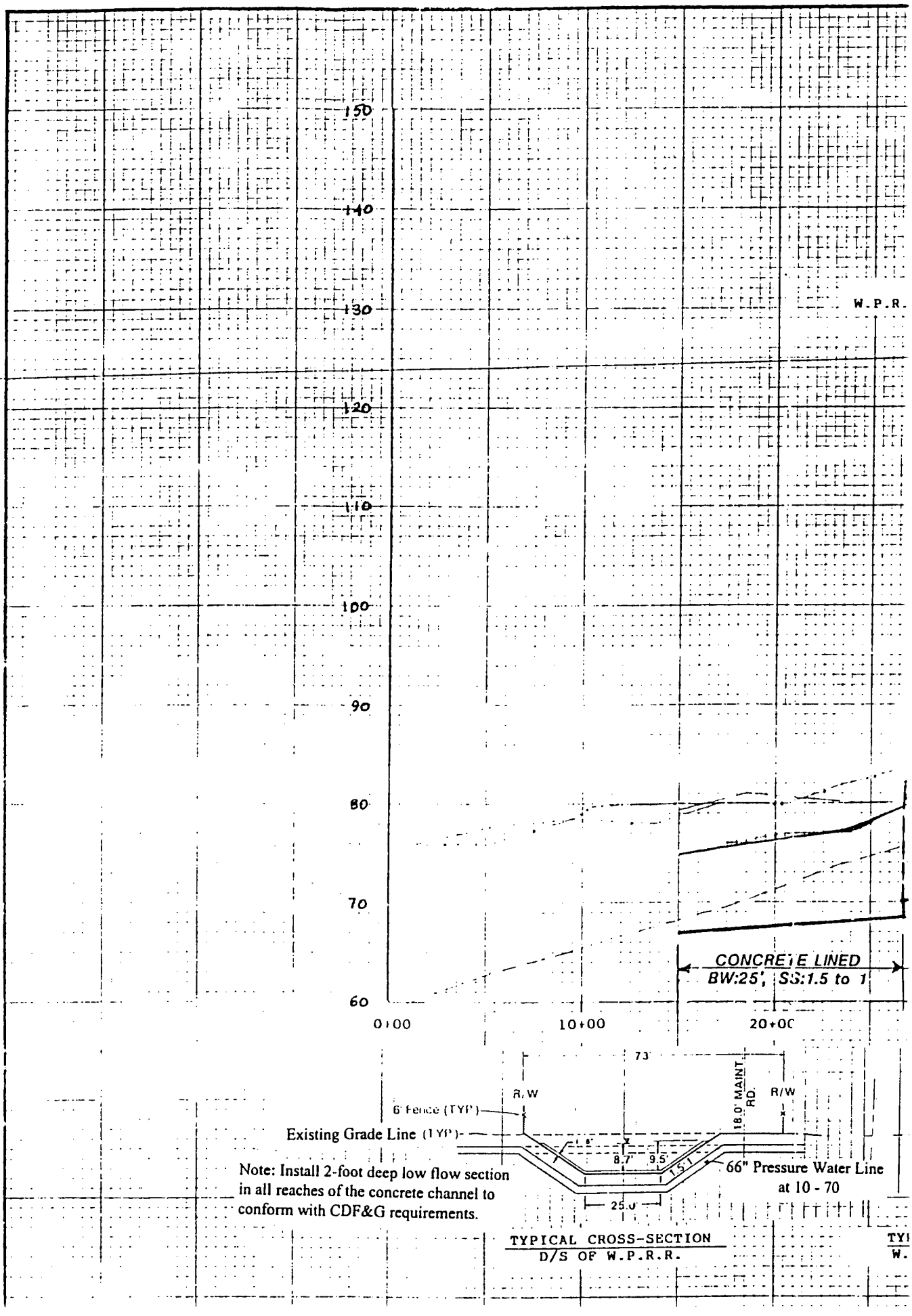
I am writing to confirm the Santa Clara Valley Water District's (District) interest in continuing to support the Upper Penitencia Creek Study. We are pleased that the Reconnaissance investigation has identified an economically viable project. The District is willing to cost-share in the Feasibility Study. We would work closely with your staff in developing a mutually agreeable Feasibility Cost-Sharing Agreement. The involvement of Corps' Division staff and the interim milestones on the Upper Guadalupe River Study have been beneficial and we hope similar approaches can be used on the Upper Penitencia Creek Study.

Sincerely,

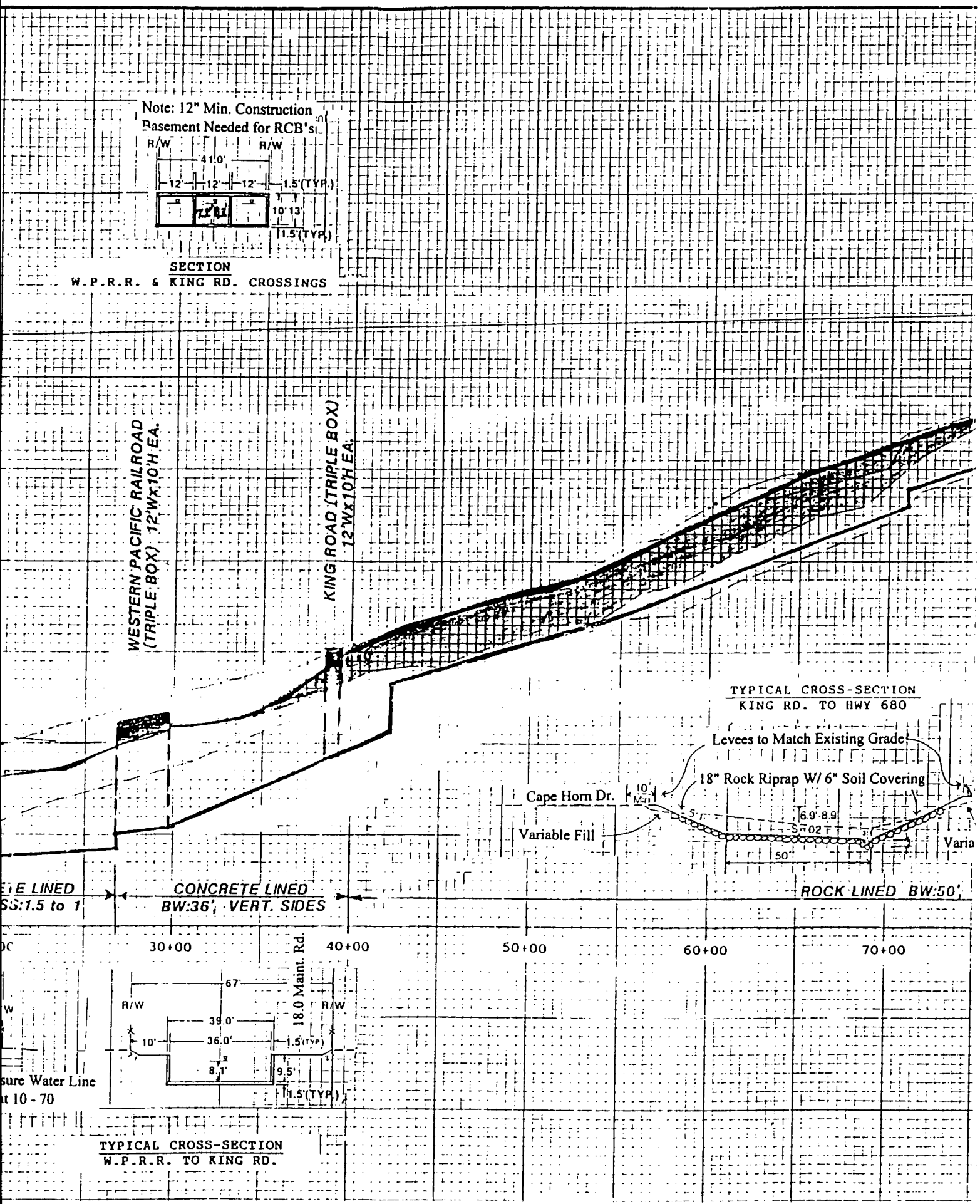
P. Kay Whitlock
Assistant General Manager

APPENDIX I

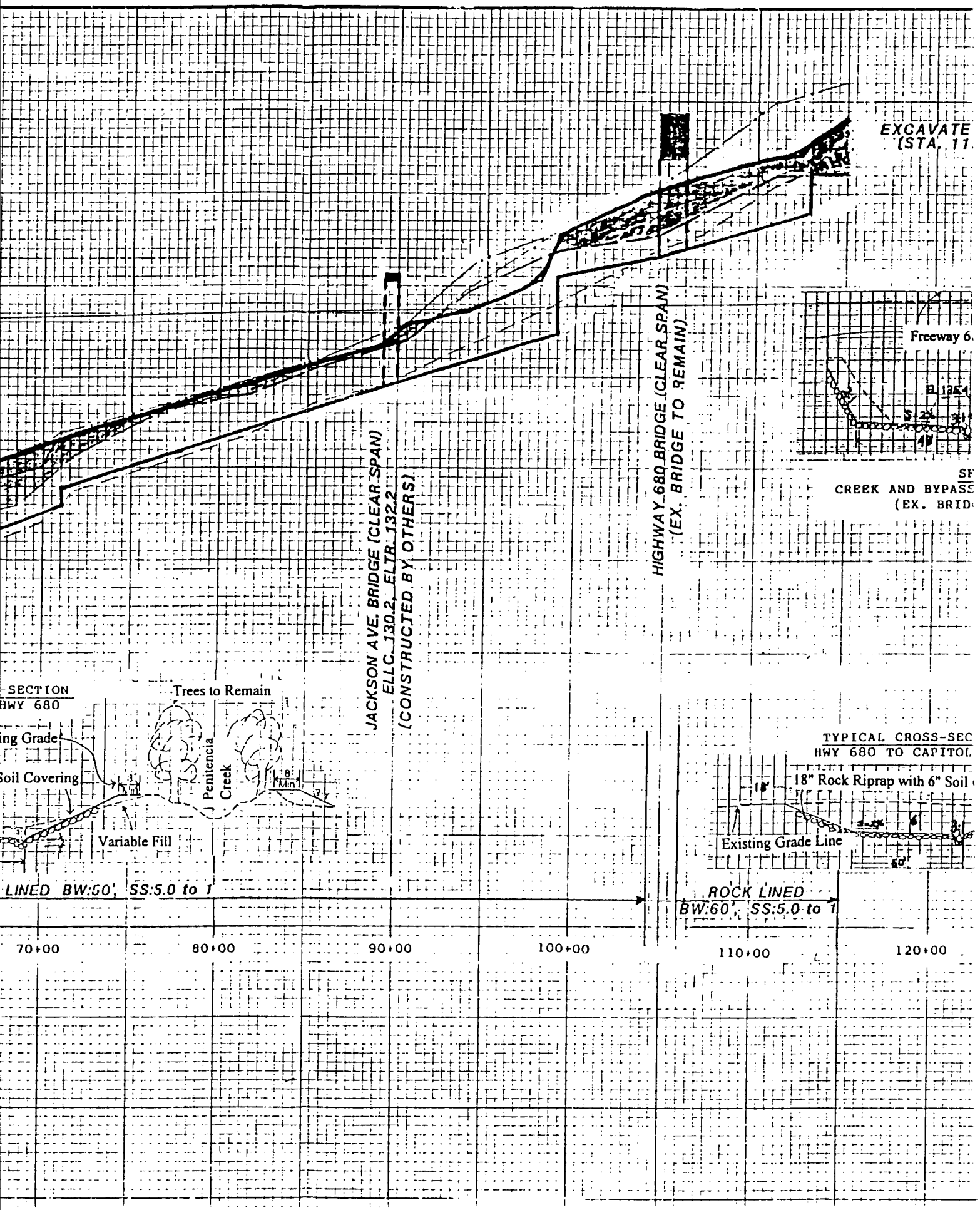
DESIGN CROSS SECTIONS


150
140
130
120
110
100
90
80
70
60
W.P.R.
0+00
10+00
20+00
CONCRETE LINED
BW:25', SS:1.5 to 1
73
R/W
6' Fence (TYP.)
Existing Grade Line (TYP.)
18.0' MAINT. RD.
R/W
8.7'
9.5'
1.5:1
25.0'
66" Pressure Water Line
at 10 - 70
Note: Install 2-foot deep low flow section
in all reaches of the concrete channel to
conform with CDF&G requirements.
TYPICAL CROSS-SECTION
D/S OF W.P.R.R.

(A)

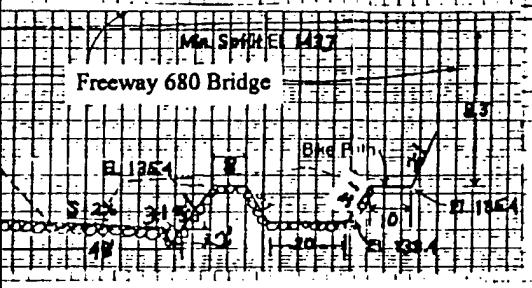

Note: 12" Min. Construction Easement Needed for RCB's
R/W
R/W
41.0'
12'
12'
12'
1.5'(TYP.)
11'Rd
10'
13'
1.5'(TYP.)
SECTION
W.P.R.R. & KING RD. CROSSINGS
WESTERN PACIFIC RAILROAD (TRIPLE BOX) 12'Wx10'H EA.
KING ROAD (TRIPLE BOX) 12'Wx10'H EA.
TYPICAL CROSS-SECTION
KING RD. TO HWY 680
Levees to Match Existing Grade
18" Rock Riprap W/ 6" Soil Covering
Cape Horn Dr.
10' Min.
Variable Fill
5'
6.9-8.9
S=02
3'
50'
Varia
E LINED
SS:1.5 to 1
CONCRETE LINED
BW:36', VERT. SIDES
ROCK LINED BW:50'
30+00
40+00
50+00
60+00
70+00
67'
R/W
R/W
18.0 Maint. Rd.
39.0'
10'
36.0'
1.5'(TYP.)
8.1'
9.5'
1.5'(TYP.)
sure Water Line
t 10 - 70
TYPICAL CROSS-SECTION
W.P.R.R. TO KING RD.

(3)


EXCAVATE
(STA. 11
JACKSON AVE. BRIDGE (CLEAR SPAN)
ELLC 130.2, ELTR 132.2
(CONSTRUCTED BY OTHERS)
HIGHWAY 680 BRIDGE (CLEAR SPAN)
(EX. BRIDGE TO REMAIN)
Freeway 6
CREEK AND BYPASS
(EX. BRID
-SECTION
HWY 680
ing Grade
Soil Covering
Trees to Remain
Penitencia Creek
Variable Fill
LINED BW:50', SS:5.0 to 1
TYPICAL CROSS-SEC
HWY 680 TO CAPITOL
18" Rock Riprap with 6" Soil
Existing Grade Line
ROCK LINED
BW:60', SS:5.0 to 1
70+00
80+00
90+00
100+00
110+00
120+00

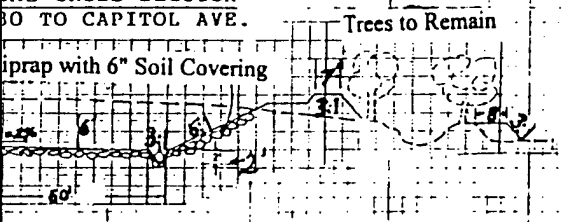
(4)

EXCAVATE NATURAL CHANNEL
(STA. 113+00 TO 117+00)



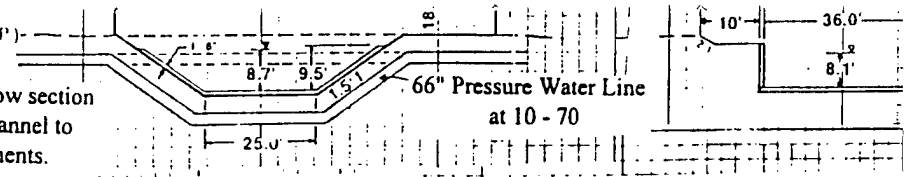
SECTION
EK AND BYPASS @ HWY 680 CROSSING
(EX. BRIDGE TO REMAIN)

AL CROSS-SECTION
O TO CAPITOL AVE.



120+00

(5)



Note: Install 2-foot deep low flow section in all reaches of the concrete channel to conform with CDF&G requirements.

TYPICAL CROSS-SECTION
D/S OF W.P.R.R.

TYPICAL CROSS-SECT
W.P.R.R. TO KING

Upper Penitencia Creek
BW = 10 Feet

PENITE

250

230

220

210

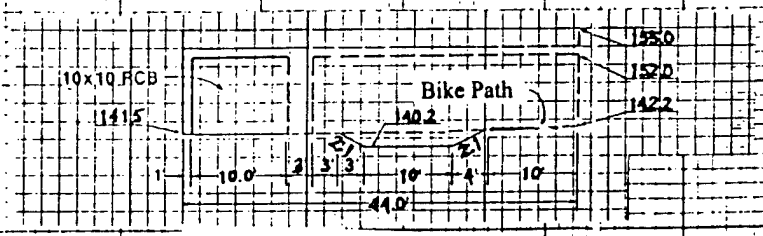
200

190

170

160

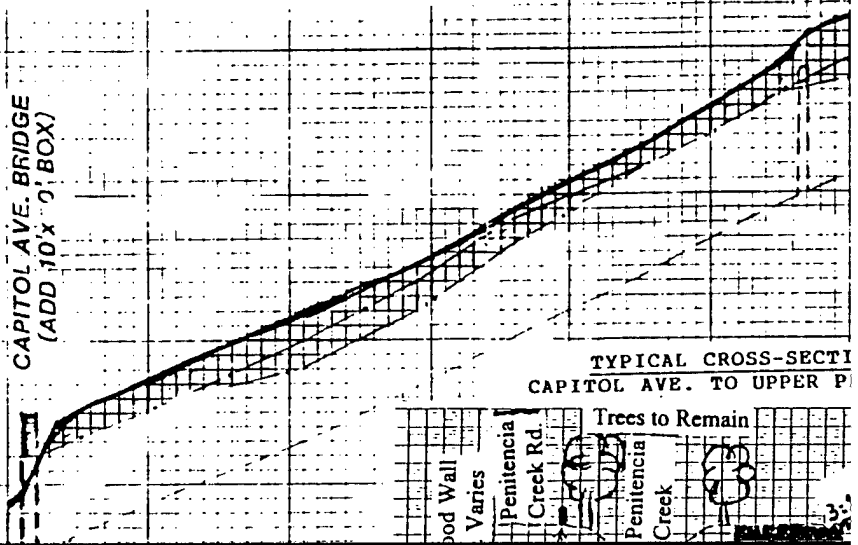
150



SECTION
CAPITOL AVE. CROSSING
(EX. BRIDGE TO REMAIN - ADD BOX)

PRIVATE ROAD
(TO BE REMOVED)

CAPITOL AVE. BRIDGE
(ADD 10'x 9' BOX)



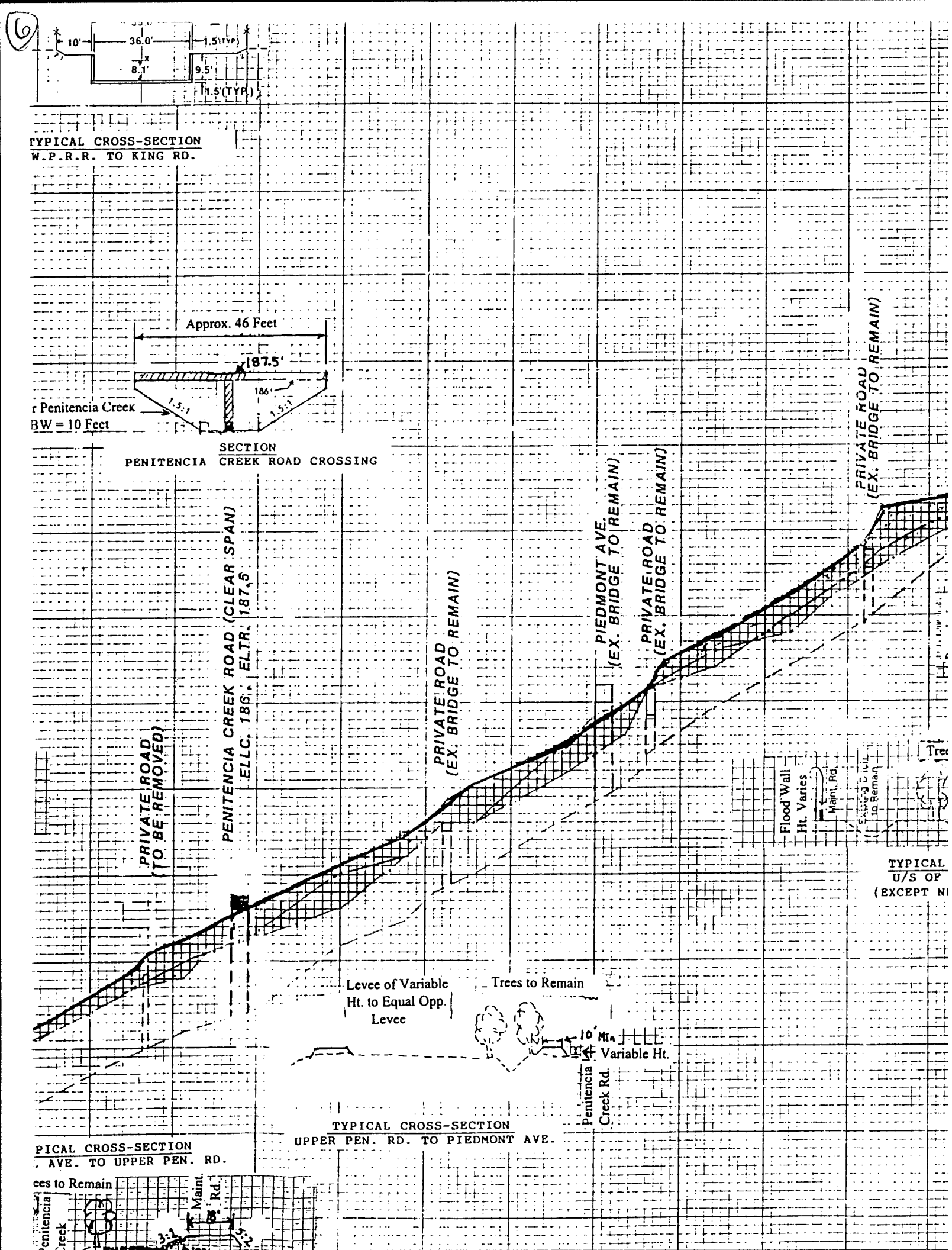
TYPICAL CROSS-SECTI
CAPITOL AVE. TO UPPER P

Trees to Remain

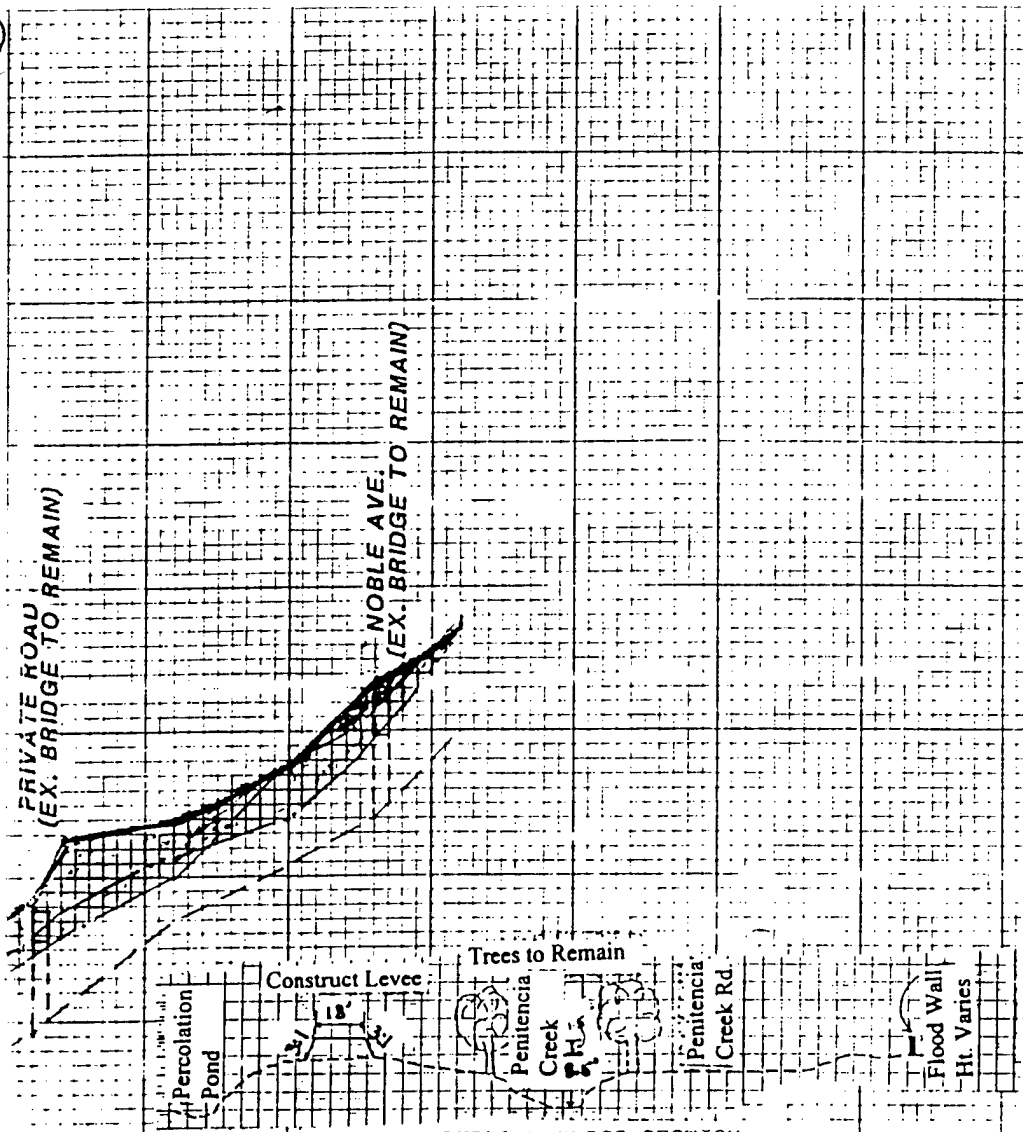
od Wall
Varies

Penitencia
Creek Rd.

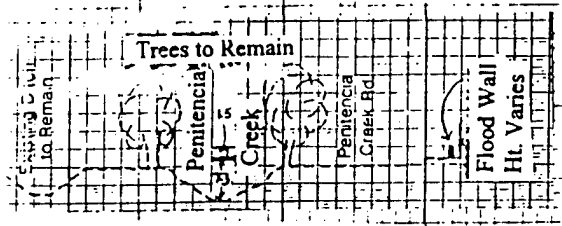
Penitencia
Creek


10'
36.0'
1.5(TYP.)
8.1'
9.5'
1.5'(TYP.)
TYPICAL CROSS-SECTION
W.P.R.R. TO KING RD.
Approx. 46 Feet
187.5'
186'
1.5:1
1.5:1
r Penitencia Creek
BW = 10 Feet
SECTION
PENITENCIA CREEK ROAD CROSSING
PRIVATE ROAD (TO BE REMOVED)
PENITENCIA CREEK ROAD (CLEAR SPAN)
ELLC. 186', ELTR. 187.5'
PRIVATE ROAD (EX. BRIDGE TO REMAIN)
PIEDMONT AVE. (EX. BRIDGE TO REMAIN)
PRIVATE ROAD (EX. BRIDGE TO REMAIN)
PRIVATE ROAD (EX. BRIDGE TO REMAIN)
Flood Wall Ht. Varies
Maint. Rd.
TYPICAL
U/S OF
(EXCEPT NI
Levee of Variable Ht. to Equal Opp. Levee
Trees to Remain
10' Min.
Variable Ht.
Penitencia Creek Rd.
TYPICAL CROSS-SECTION
UPPER PEN. RD. TO PIEDMONT AVE.
PICAL CROSS-SECTION
. AVE. TO UPPER PEN. RD.
ees to Remain
Maint. Rd.
8'
3:1
3:1

(7)



TYPICAL CROSS-SECTION
U/S OF PIEDMONT AVE.
(NEAR PERC. PONDS)



TYPICAL CROSS-SECTION
U/S OF PIEDMONT AVE.
(EXCEPT NEAR PERC. PONDS)

LEFT BANK
RIGHT BANK
GRADE OF BYPASS SITE
CHANNEL BOTTOM

(8)

NOTES: 1) CROSS-SECTIONS LOOKING UPSTREAM.

2) FLOODWALLS AND/OR LEVEES ALONG BOTH BANKS OF CREEK ARE 100' APART.

3) CROSS-SECTIONS NOT DRAWN TO SCALE.

BYPASS CHANNEL INVERT
EXCAVATION OF NATURAL CHANNEL
REQUIRED FLOODWALL OR LEVEE
100-YEAR WATER SURFACE ELEVATION

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY

TRACED BY

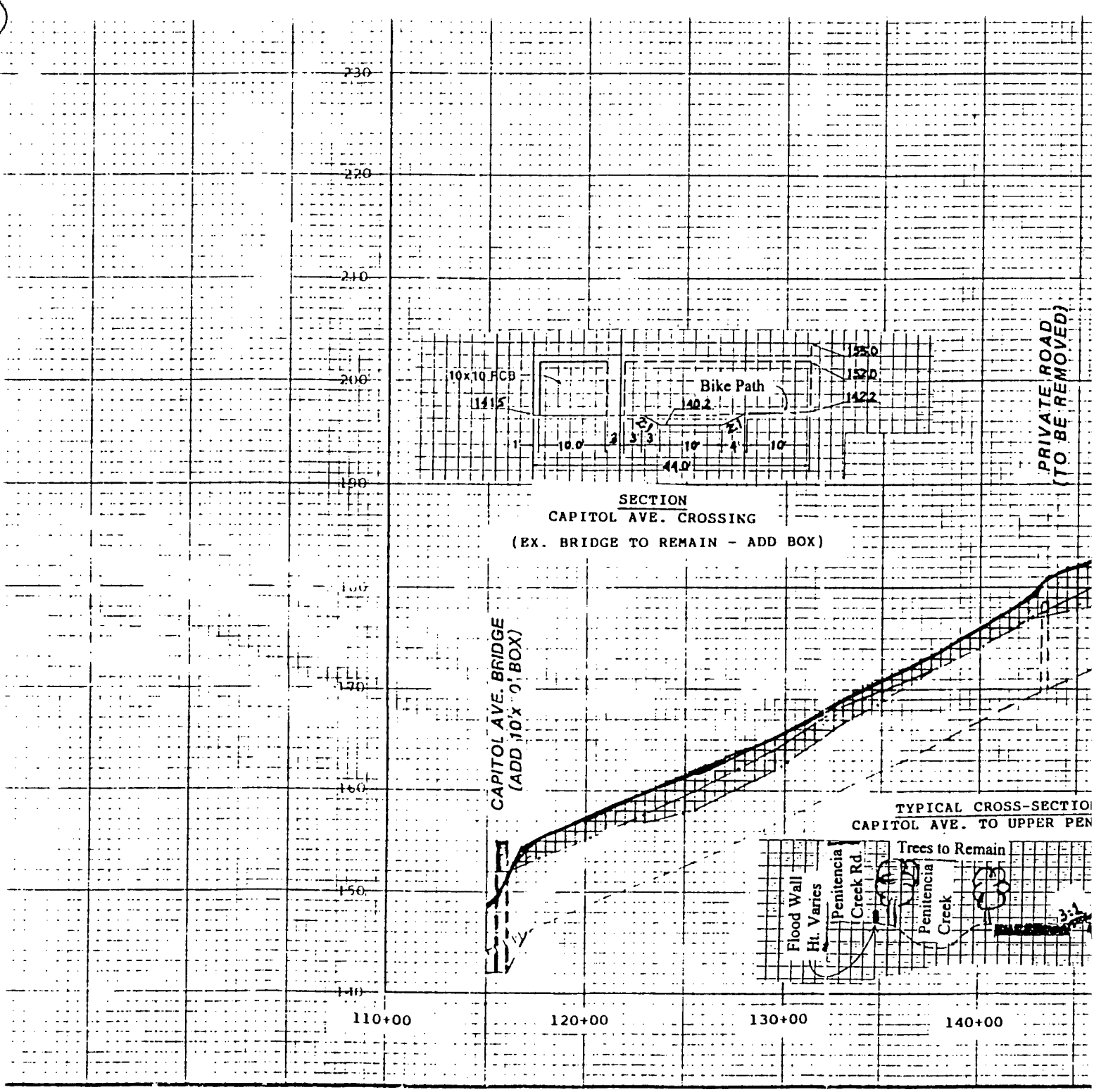
CHECKED BY

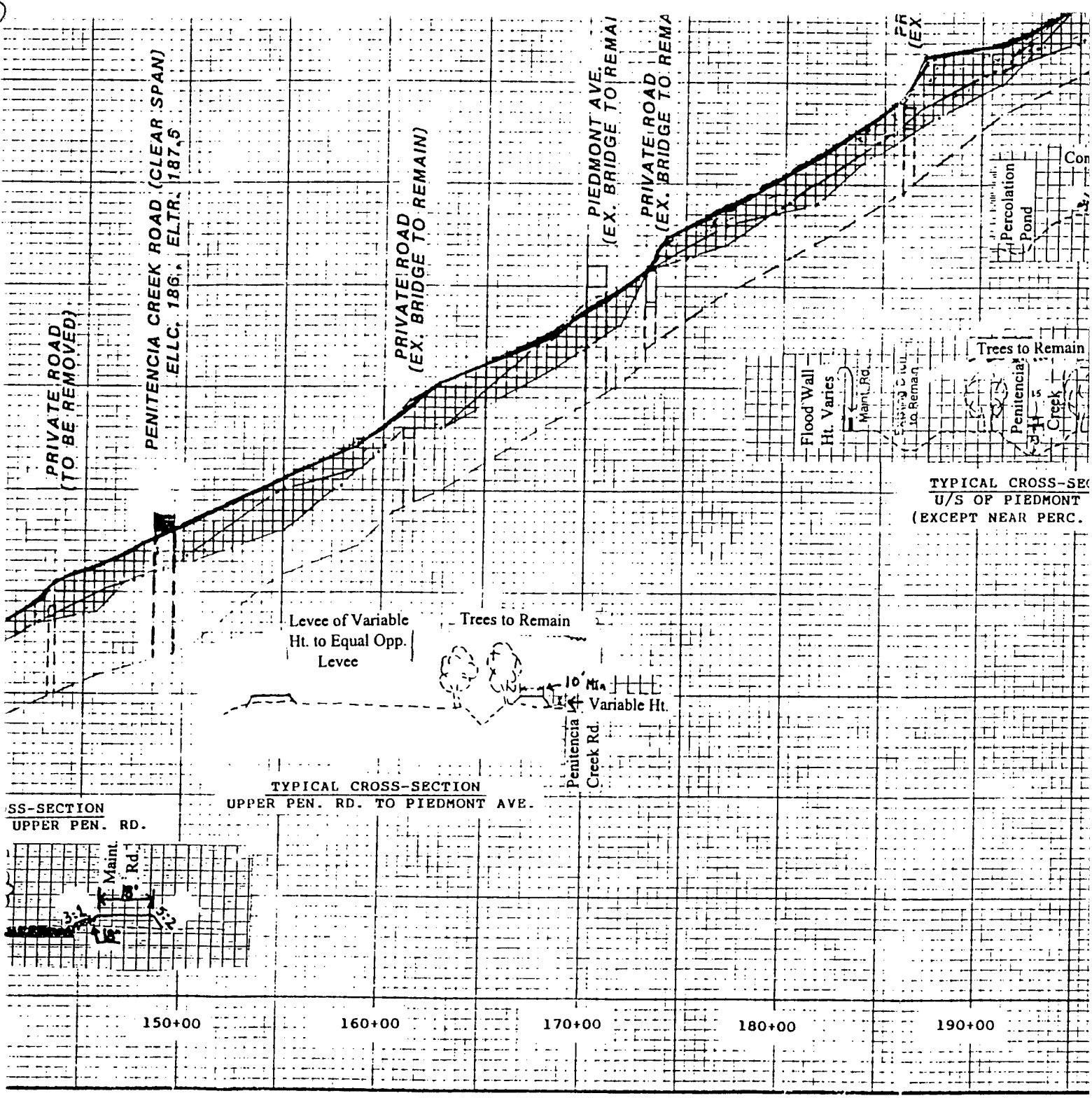
SUBMITTED

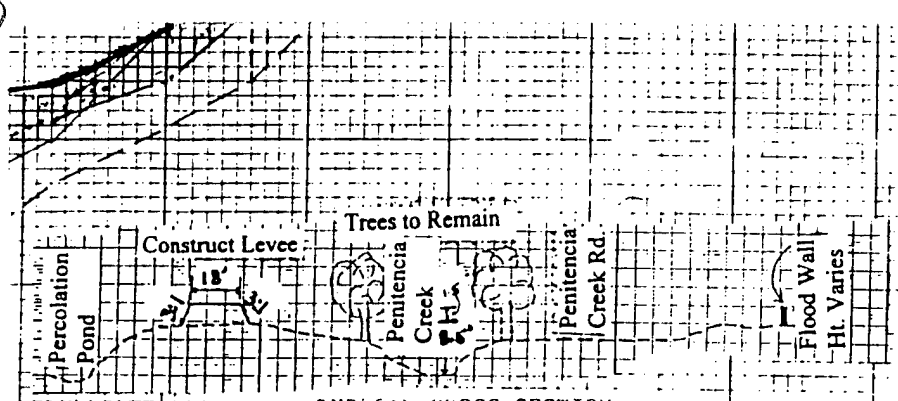
UPPER PENITENCIA CREEK

EXISTING CONDITIONS OF CHANNEL

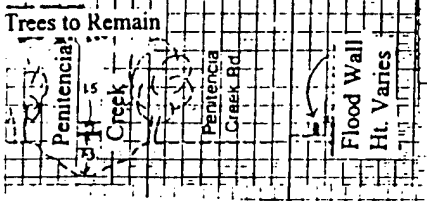
(9)


230
220
210
200
190
180
170
160
150
140
110+00
120+00
130+00
140+00
10x10 RCB
Bike Path
135.0
132.0
141.5
140.2
142.2
1
10.0
3
3
3
10'
4
10'
44.0
SECTION
CAPITOL AVE. CROSSING
(EX. BRIDGE TO REMAIN - ADD BOX)
PRIVATE ROAD
(TO BE REMOVED)
CAPITOL AVE. BRIDGE
(ADD 10'x 9' BOX)
TYPICAL CROSS-SECTIO
CAPITOL AVE. TO UPPER PEN
Trees to Remain
Flood Wall
Ht. Varies
Penitencia
Creek Rd.
Penitencia
Creek
3:1


PRIVATE ROAD (TO BE REMOVED)
PENITENCIA CREEK ROAD (CLEAR SPAN) ELLC. 186.1 ELTR. 187.5
PRIVATE ROAD (EX. BRIDGE TO REMAIN)
PIEDMONT AVE. (EX. BRIDGE TO REMAI
PRIVATE ROAD (EX. BRIDGE TO REMA
Percolation Pond
Trees to Remain
Flood Wall Ht. Varies
Maint. Rd.
Penitencia Creek
TYPICAL CROSS-SEC
U/S OF PIEDMONT
(EXCEPT NEAR PERC.
Levee of Variable Ht. to Equal Opp. Levee
Trees to Remain
10' Min.
Variable Ht.
Penitencia Creek Rd.
TYPICAL CROSS-SECTION
UPPER PEN. RD. TO PIEDMONT AVE.
SS-SECTION
UPPER PEN. RD.
Maint. Rd.
150+00
160+00
170+00
180+00
190+00



TYPICAL CROSS-SECTION
U/S OF PIEDMONT AVE.
(NEAR PERC. PONDS)



AL CROSS-SECTION
OF PIEDMONT AVE.
NEAR PERC. PONDS)

LEFT BANK
RIGHT BANK
GRADE OF BYPASS SITE
CHANNEL BOTTOM

00 200+00 210+00

SYMBOL

DRAWN B

TRACED

CHECKED

SUBMITTI

APPROVAL

ALT. #1: BYPASS D/S

(12)

NOTES: 1) CROSS-SECTIONS LOOKING UPSTREAM.

2) FLOODWALLS AND/OR LEVEES ALONG BOTH BANKS OF CREEK ARE 100' APART.

3) CROSS-SECTIONS NOT DRAWN TO SCALE.

BYPASS CHANNEL INVERT
EXCAVATION OF NATURAL CHANNEL
REQUIRED FLOODWALL OR LEVEE
100-YEAR WATER SURFACE ELEVATION

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY

TRACED BY

CHECKED BY

SUBMITTED

UPPER PENITENCIA CREEK
EXISTING CONDITIONS OF CHANNEL

APPROVAL RECOMMENDED:

CHIEF, DESIGN BRANCH

APPROVED

CHIEF, PLANNING ENGINEERING DIVISION

DATE

PREPARED UNDER THE DIRECTION OF

COLONEL, C.E. DISTRICT ENGINEER

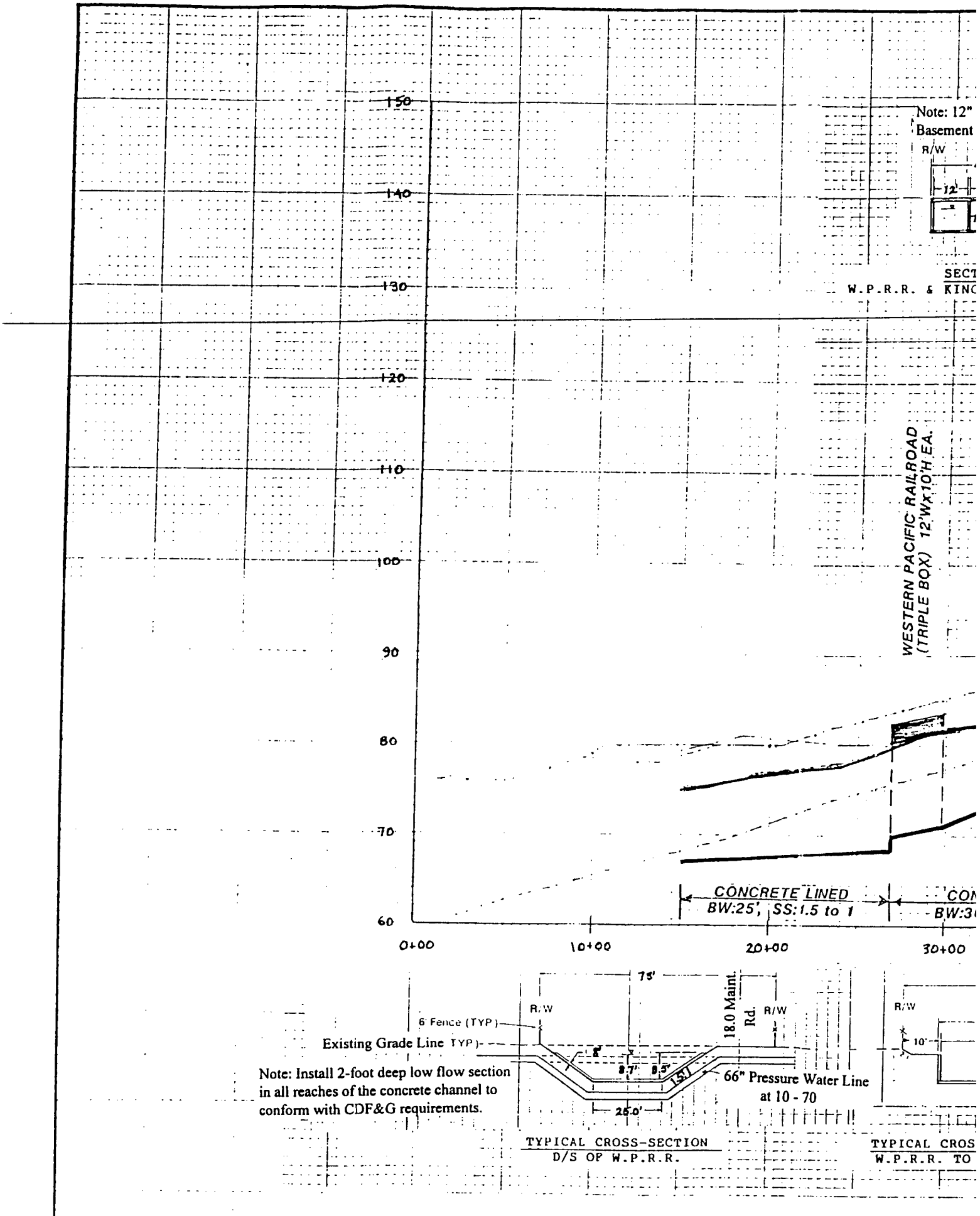
SCALE

JOB NO

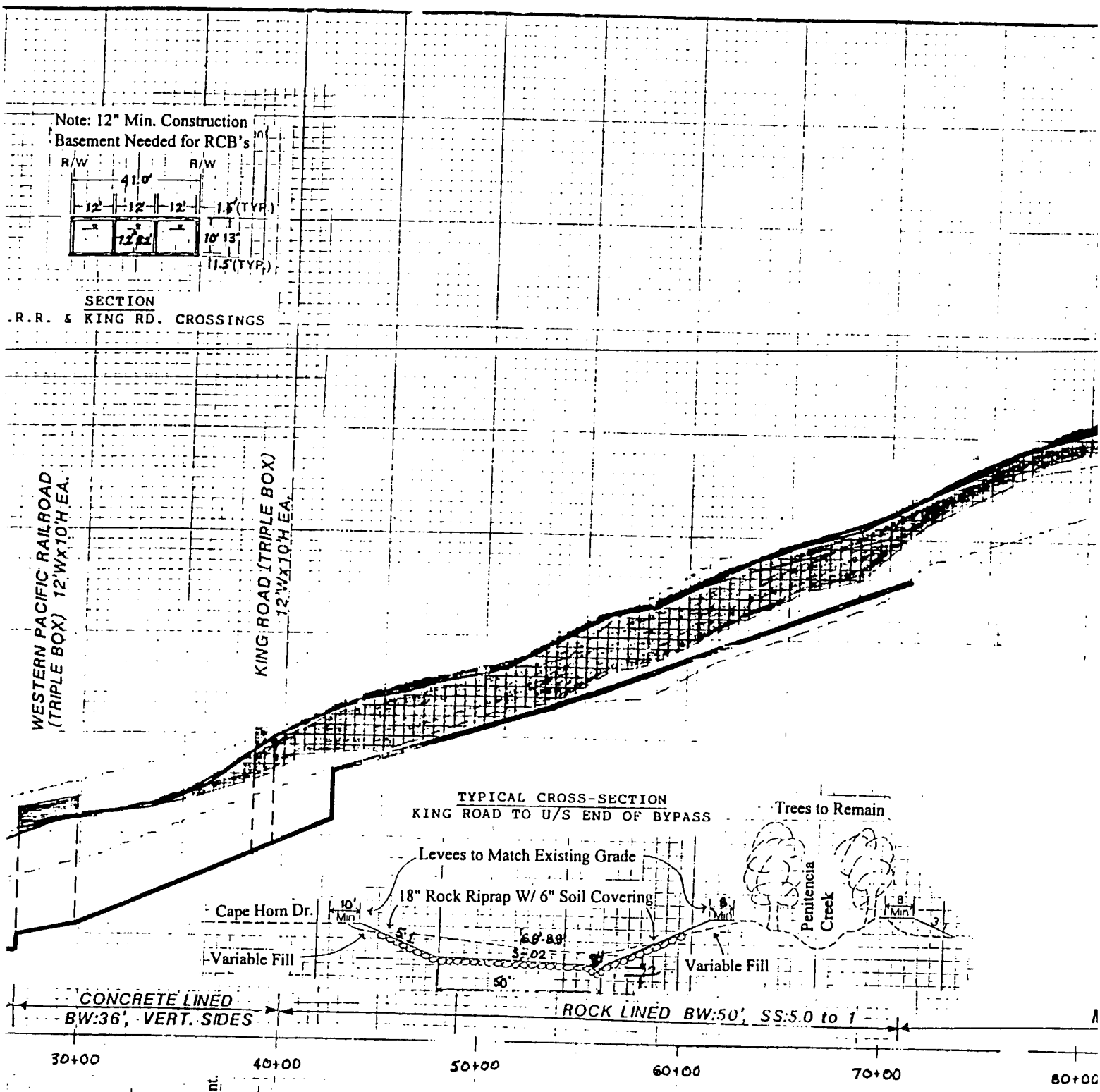
DRAWING NUMBER

SHEET

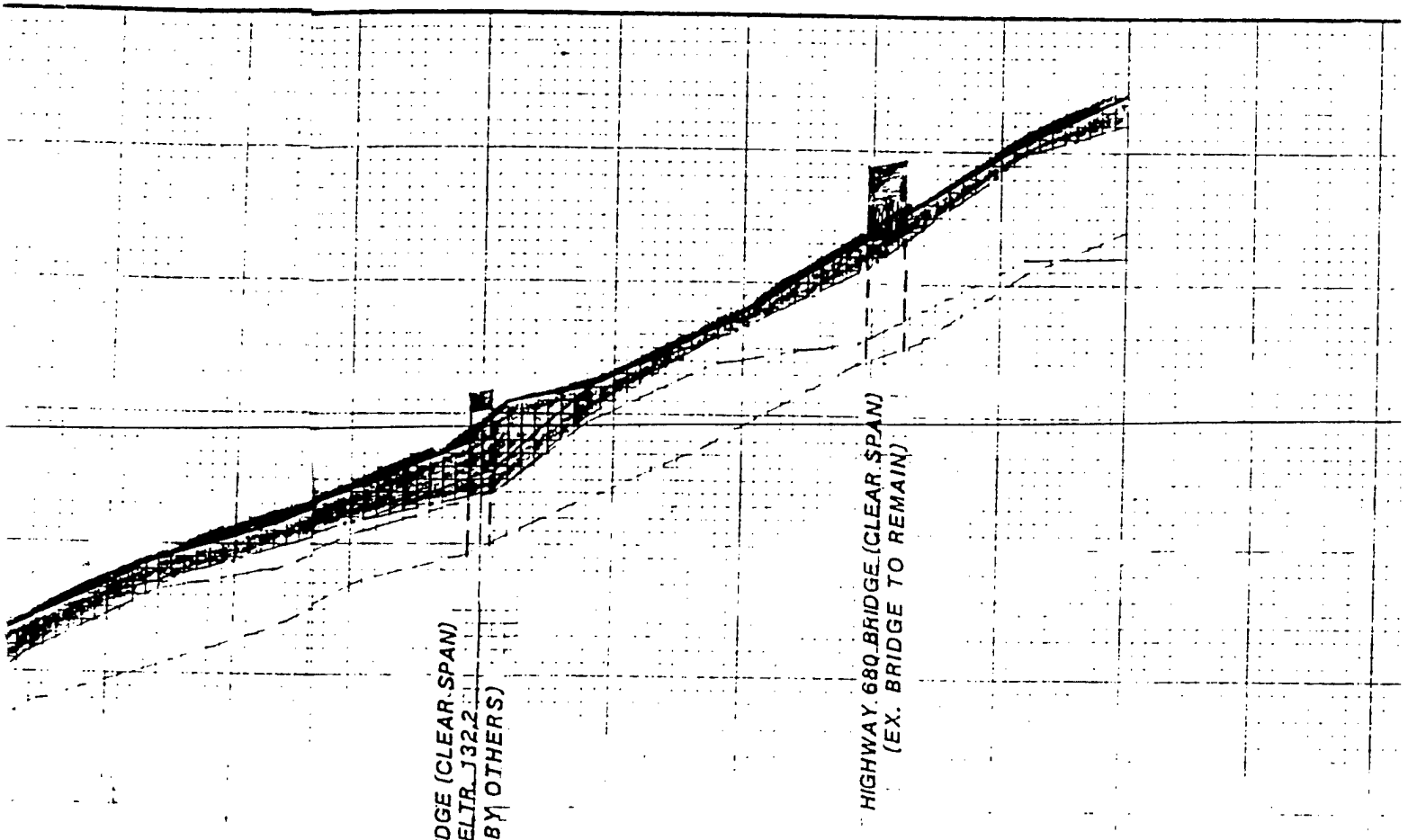
PASS D/S & MODIFIED FLOODPLAIN U/S


150
140
130
120
110
100
90
80
70
60
0+00
10+00
20+00
30+00
Note: 12"
Basement
R/W
12'
SECT
W.P.R.R. & KINC
WESTERN PACIFIC RAILROAD
(TRIPLE BOX) 12'Wx10'H EA.
CONCRETE LINED
BW:25', SS:1.5 to 1
CON
BW:3
75'
R/W
6' Fence (TYP.)
Existing Grade Line TYP.)
18.0 Maint.
Rd.
R/W
8'
8.7'
8.5'
1.5:1
66" Pressure Water Line
at 10 - 70
25.0'
Note: Install 2-foot deep low flow section
in all reaches of the concrete channel to
conform with CDF&G requirements.
TYPICAL CROSS-SECTION
D/S OF W.P.R.R.
R/W
10'
TYPICAL CROS
W.P.R.R. TO

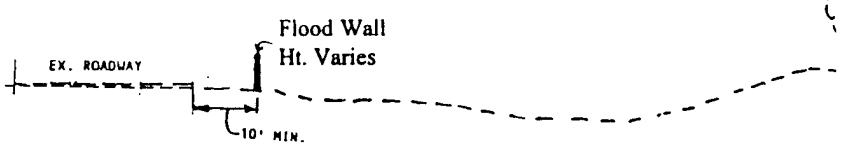
(2)


Note: 12" Min. Construction
Basement Needed for RCB's
R/W
R/W
41.0'
12'
12'
12'
1.5'(TYP.)
10' 13"
1.5'(TYP.)
SECTION
.R.R. & KING RD. CROSSINGS
WESTERN PACIFIC RAILROAD
(TRIPLE BOX) 12'Wx10'H EA.
KING ROAD (TRIPLE BOX)
12'Wx10'H EA.
TYPICAL CROSS-SECTION
KING ROAD TO U/S END OF BYPASS
Trees to Remain
Levees to Match Existing Grade
18" Rock Riprap W/ 6" Soil Covering
Cape Horn Dr.
10' Min
5:1
6.8'-8.9'
3.02
Variable Fill
Variable Fill
50'
Penitencia Creek
8' Min
3:1
CONCRETE LINED
BW:36', VERT. SIDES
ROCK LINED BW:50', SS:5.0 to 1
30+00
40+00
50+00
60+00
70+00
80+00
67'
R/W
39.0'
10'
36.0'
1.5(TYP.)
8.1'
9.5'
1.5'(TYP.)
18.0 Maint. Rd.
R/W
'PICAL CROSS-SECTION
.P.R.R. TO KING RD.

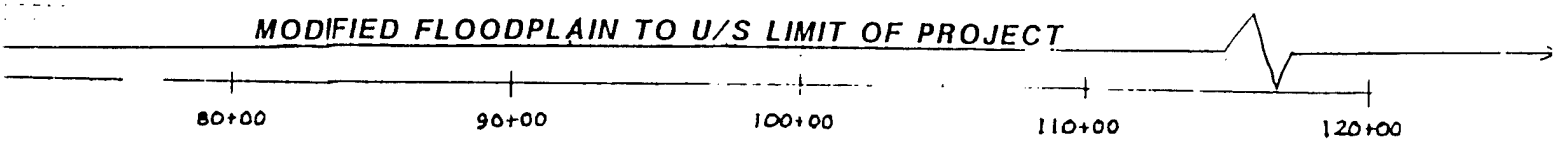
(3)



TYPICAL CROSS-SECTION
U/S LIMIT OF BYPASS TO CAPITOL AVE.



MODIFIED FLOODPLAIN TO U/S LIMIT OF PROJECT



(4)

Trees to Remain

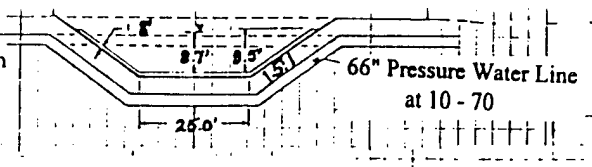
L AVE.

+00

(5)

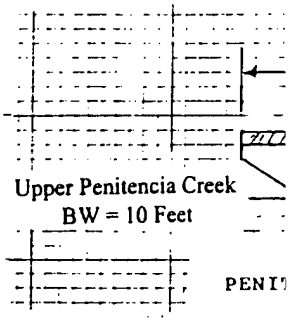
Existing Grade Line Typ.

Note: Install 2-foot deep low flow section in all reaches of the concrete channel to conform with CDF&G requirements.



TYPICAL CROSS-SECTION
D/S OF W.P.R.R.

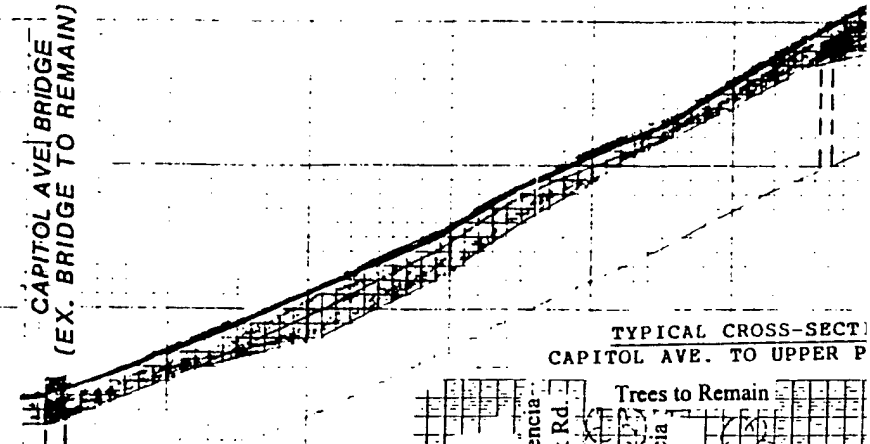
TYPICAL CROSS-SEC
W.P.R.R. TO KING



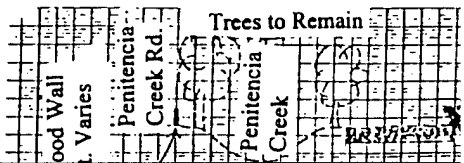
PENI

PRIVATE ROAD
(TO BE REMOVED)

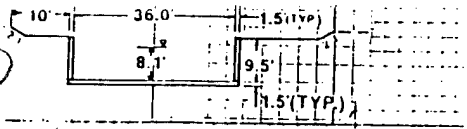
CAPITOL AVE. BRIDGE
(EX. BRIDGE TO REMAIN)



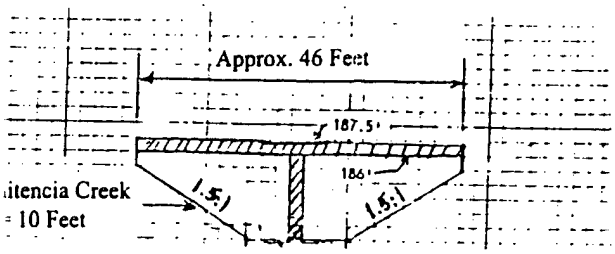
TYPICAL CROSS-SECT
CAPITOL AVE. TO UPPER P



(6)



ICAL CROSS-SECTION
.R.R. TO KING RD.



itencia Creek
= 10 Feet

SECTION
PENITENCIA CREEK ROAD CROSSING

PRIVATE ROAD (TO BE REMOVED)

PENITENCIA CREEK ROAD (CLEAR SPAN)

PRIVATE ROAD (EX. BRIDGE TO REMAIN)

PIEDMONT AVE. (EX. BRIDGE TO REMAIN)

PRIVATE ROAD (EX. BRIDGE TO REMAIN)

PRIVATE ROAD (EX. BRIDGE TO REMAIN)

Percolation Pond

Flood Wall Ht. Varies

Maint. Rd.

Existing Ditch to Remain

Trees to Re

Penitencia

TYPICAL CROS
U/S OF PIEDM
(EXCEPT NEAR P

Levee of Variable Ht. to Equal Opp. Levee

Trees to Remain

10' Min.

Variable Ht.

Penitencia Creek Rd.

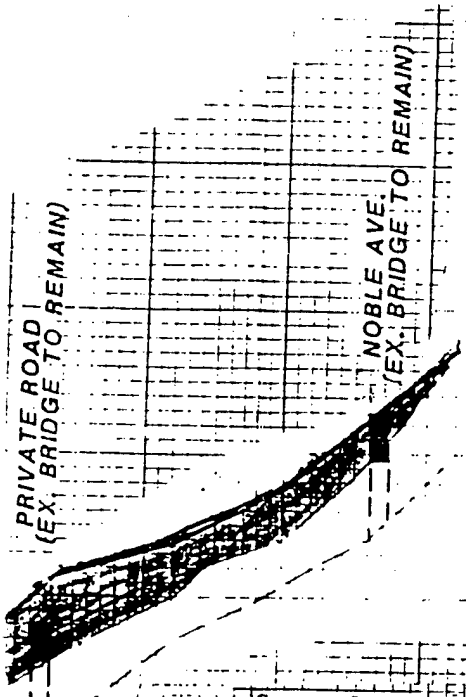
TYPICAL CROSS-SECTION
UPPER PEN. RD. TO PIEDMONT AVE.

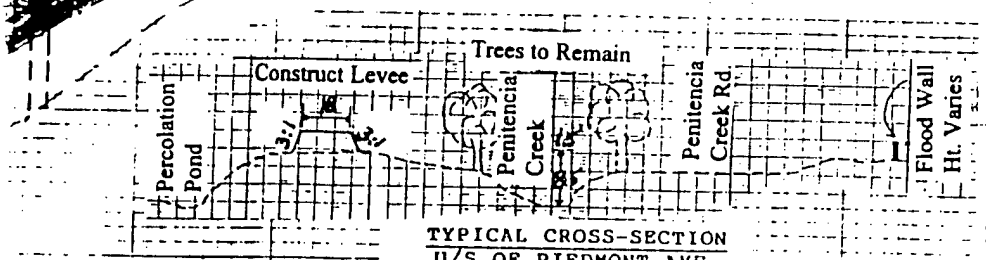
CROSS-SECTION
TO UPPER PEN. RD.

emain

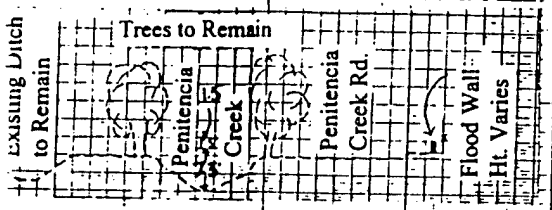
Maint. Rd.

(1)





TYPICAL CROSS-SECTION
U/S OF PIEDMONT AVE.
(NEAR PERC. PONDS)



TYPICAL CROSS-SECTION
U/S OF PIEDMONT AVE.
(EXCEPT NEAR PERC. PONDS)

LEFT BANK
RIGHT BANK
GRADE OF BYPASS SITE
CHANNEL BOTTOM

(8)

NOTES: 1) CROSS-SECTIONS LOOKING UPSTREAM.

2) FLOODWALLS AND/OR LEVEES ALONG BOTH BANKS OF CREEK ARE 100' APART.

3) CROSS-SECTIONS NOT DRAWN TO SCALE.

100-YEAR WATER SURFACE ELEVATION

REQUIRED FLOODWALL OR LEVEE

BYPASS CHANNEL INVERT

SYMBOL	DESCRIPTION	DATE	APPROVAL
REVISIONS			

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY

TRACED BY

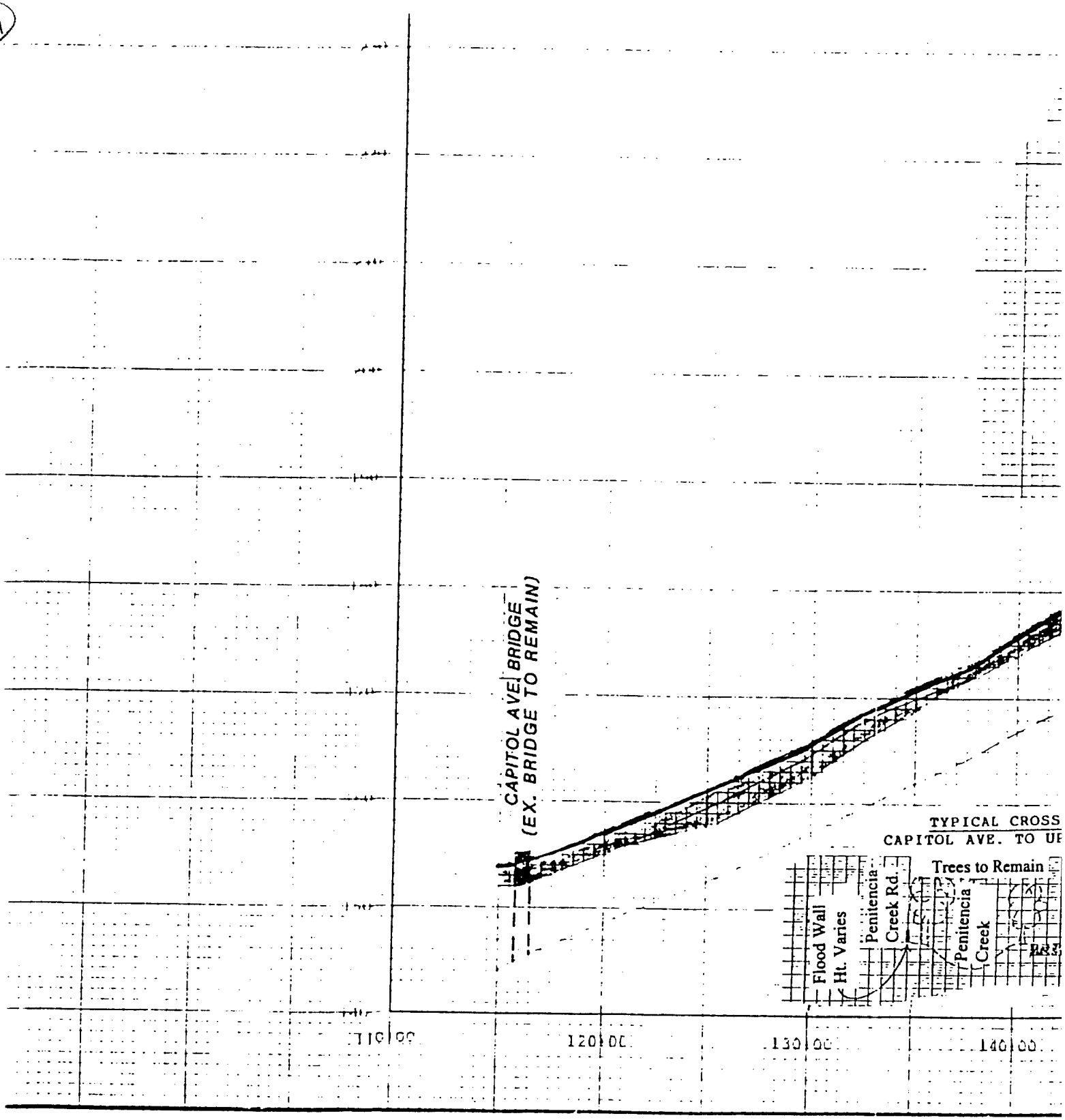
CHECKED BY

SUBMITTED

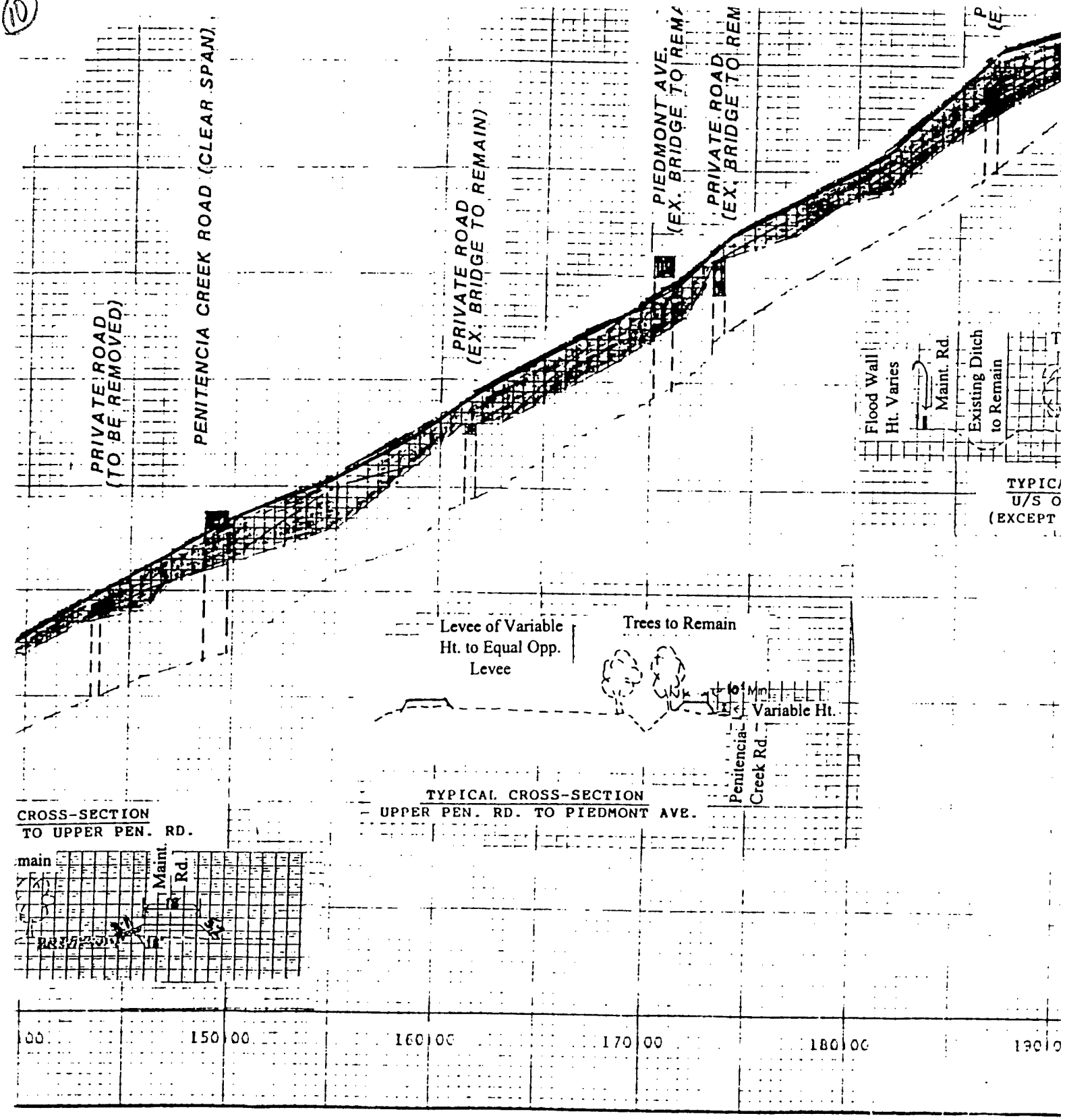
UPPER PENITENCIA CREEK

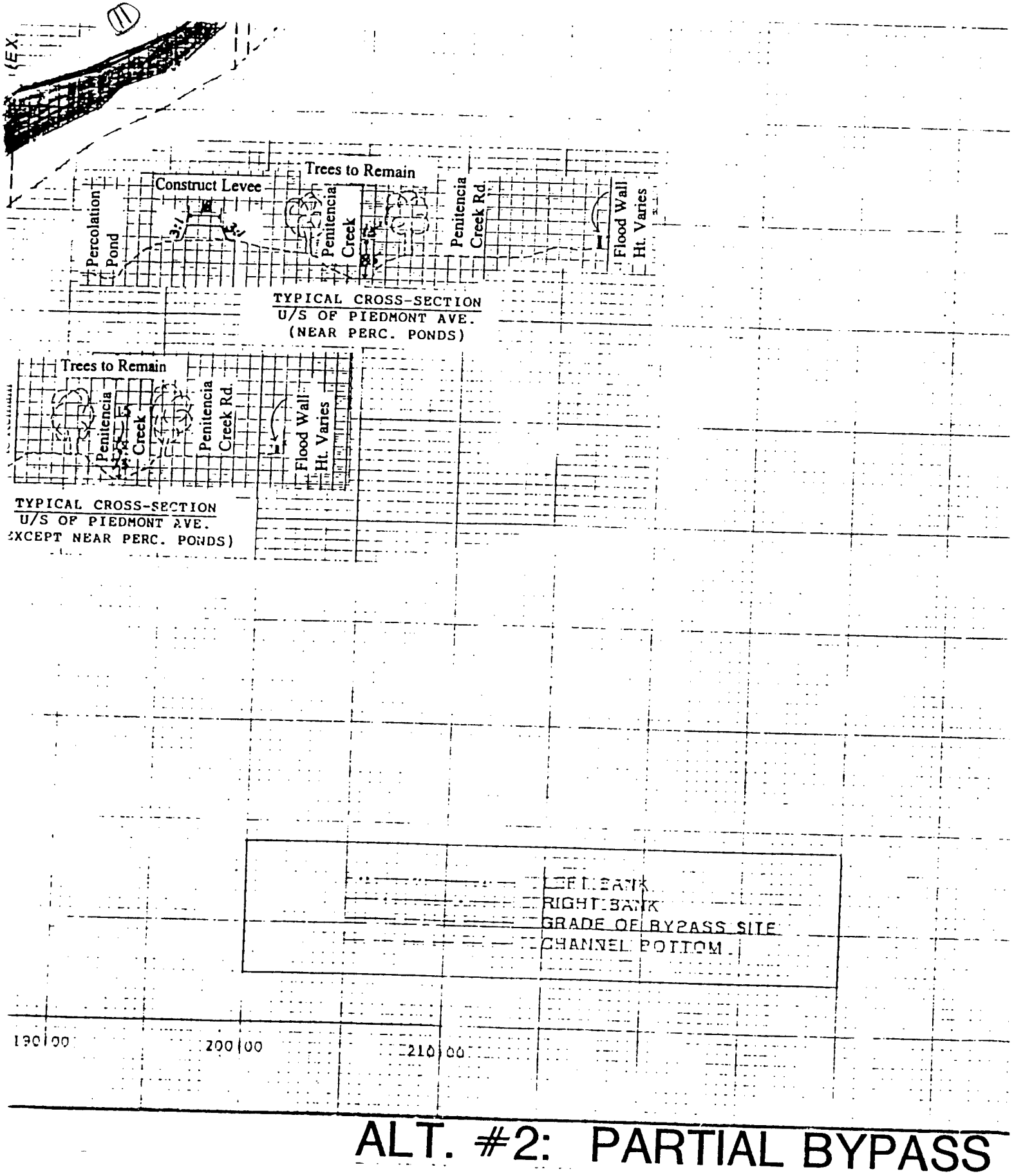
EXISTING CONDITIONS OF CHANNEL

(9)


CAPITOL AVE. BRIDGE
(EX. BRIDGE TO REMAIN)
TYPICAL CROSS
CAPITOL AVE. TO UP
Trees to Remain
Flood Wall
Ht. Varies
Penitencia
Creek Rd.
Penitencia
Creek
110 00
120 00
130 00
140 00

(10)


PRIVATE ROAD (TO BE REMOVED)
PENITENCIA CREEK ROAD (CLEAR SPAN)
PRIVATE ROAD (EX. BRIDGE TO REMAIN)
PIEDMONT AVE. (EX. BRIDGE TO REM
PRIVATE ROAD (EX. BRIDGE TO REM
Flood Wall Ht. Varies
Maint. Rd.
Existing Ditch to Remain
Levee of Variable Ht. to Equal Opp. Levee
Trees to Remain
Variable Ht.
Penitencia Creek Rd.
TYPICAL CROSS-SECTION
UPPER PEN. RD. TO PIEDMONT AVE.
CROSS-SECTION
TO UPPER PEN. RD.
main
Maint. Rd.
150 00
160 00
170 00
180 00



ALT. #2: PARTIAL BYPASS

(12)

NOTES: 1) CROSS-SECTIONS LOOKING UPSTREAM.

2) FLOODWALLS AND/OR LEVEES ALONG BOTH BANKS OF CREEK ARE 100' APART.

3) CROSS-SECTIONS NOT DRAWN TO SCALE.

100-YEAR WATER SURFACE ELEVATION

REQUIRED FLOODWALL OR LEVEE

BYPASS CHANNEL INVERT

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY

TRACED BY

CHECKED BY

SUBMITTED

UPPER PENITENCIA CREEK
EXISTING CONDITIONS OF CHANNEL

APPROVAL RECOMMENDED

CHIEF, DESIGN BRANCH

APPROVED DATE

CHIEF, PLANNING ENGINEERING DIVISION

PREPARED UNDER THE DIRECTION OF

COLONEL, C.E., DISTRICT ENGINEER

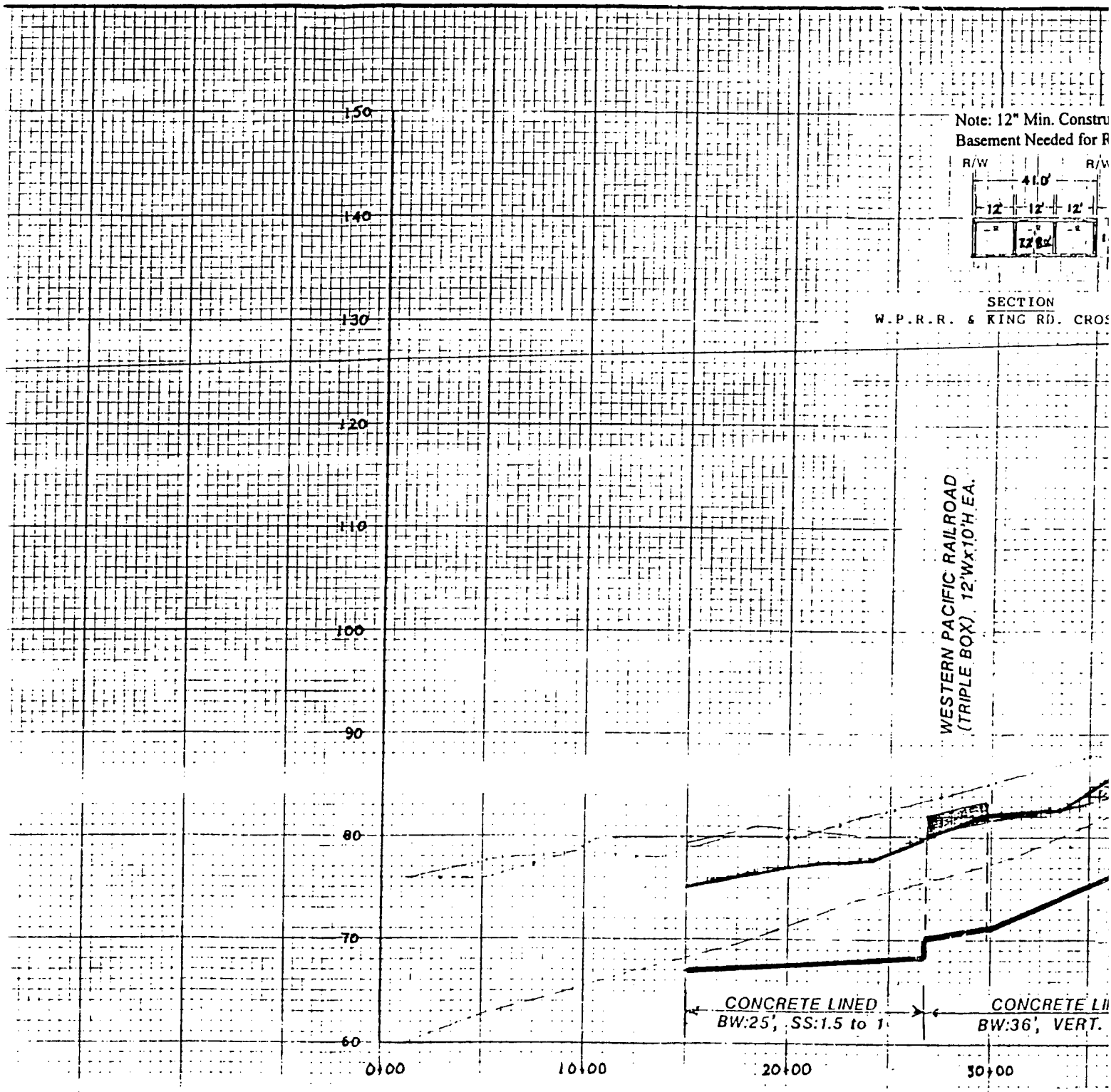
SCALE JOB NO

DRAWING NUMBER

SHEET

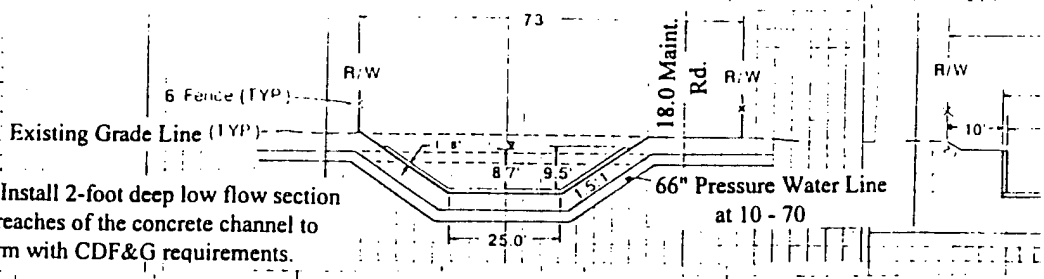
PASS D/S & MODIFIED FLOODPLAIN U/S

(1)



Note: 12" Min. Constru
Basement Needed for R

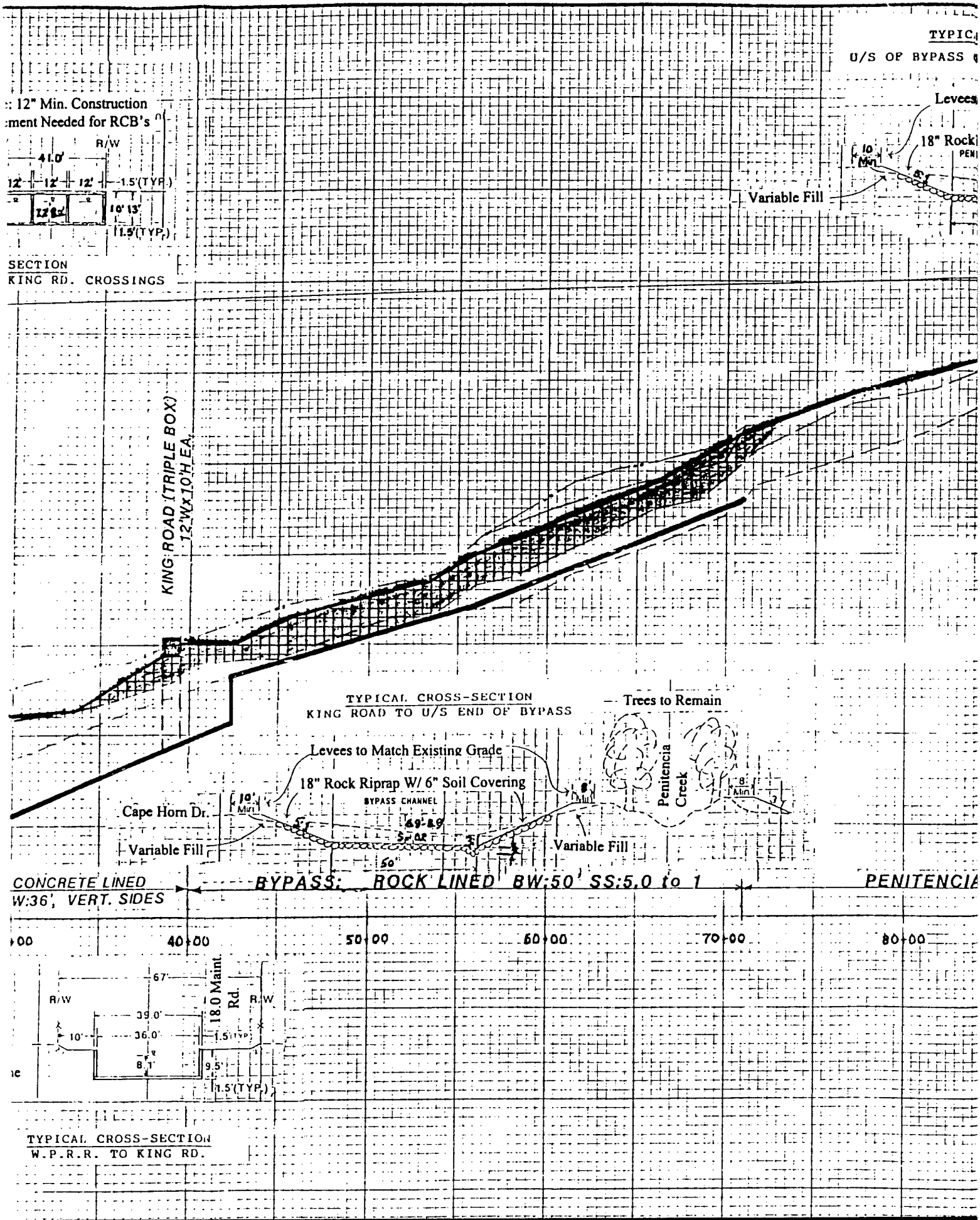
SECTION
W.P.R.R. & KING RD. CROS



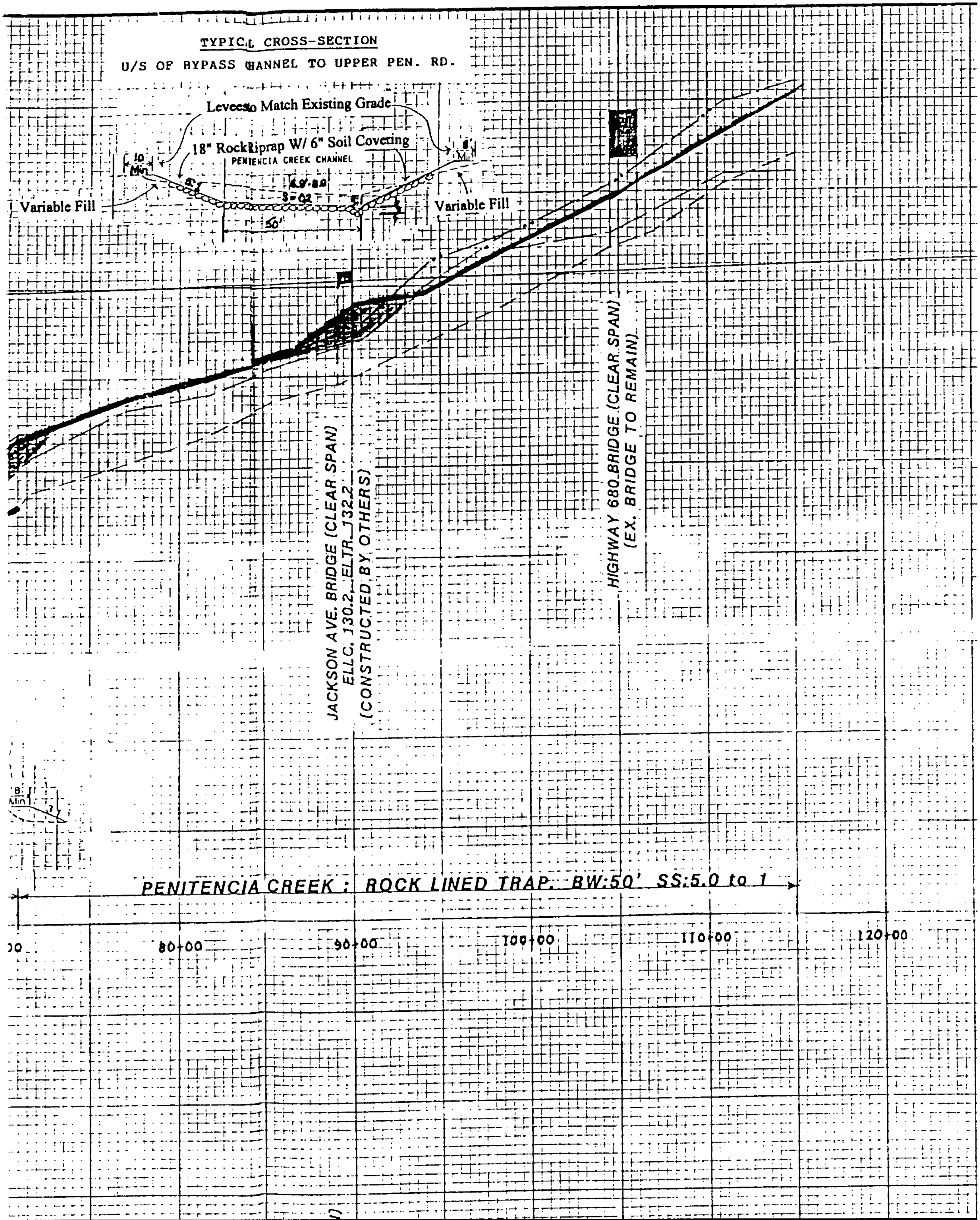
Note: Install 2-foot deep low flow section in all reaches of the concrete channel to conform with CDF&G requirements.

TYPICAL CROSS-SECTION
D/S OF W.P.R.R.

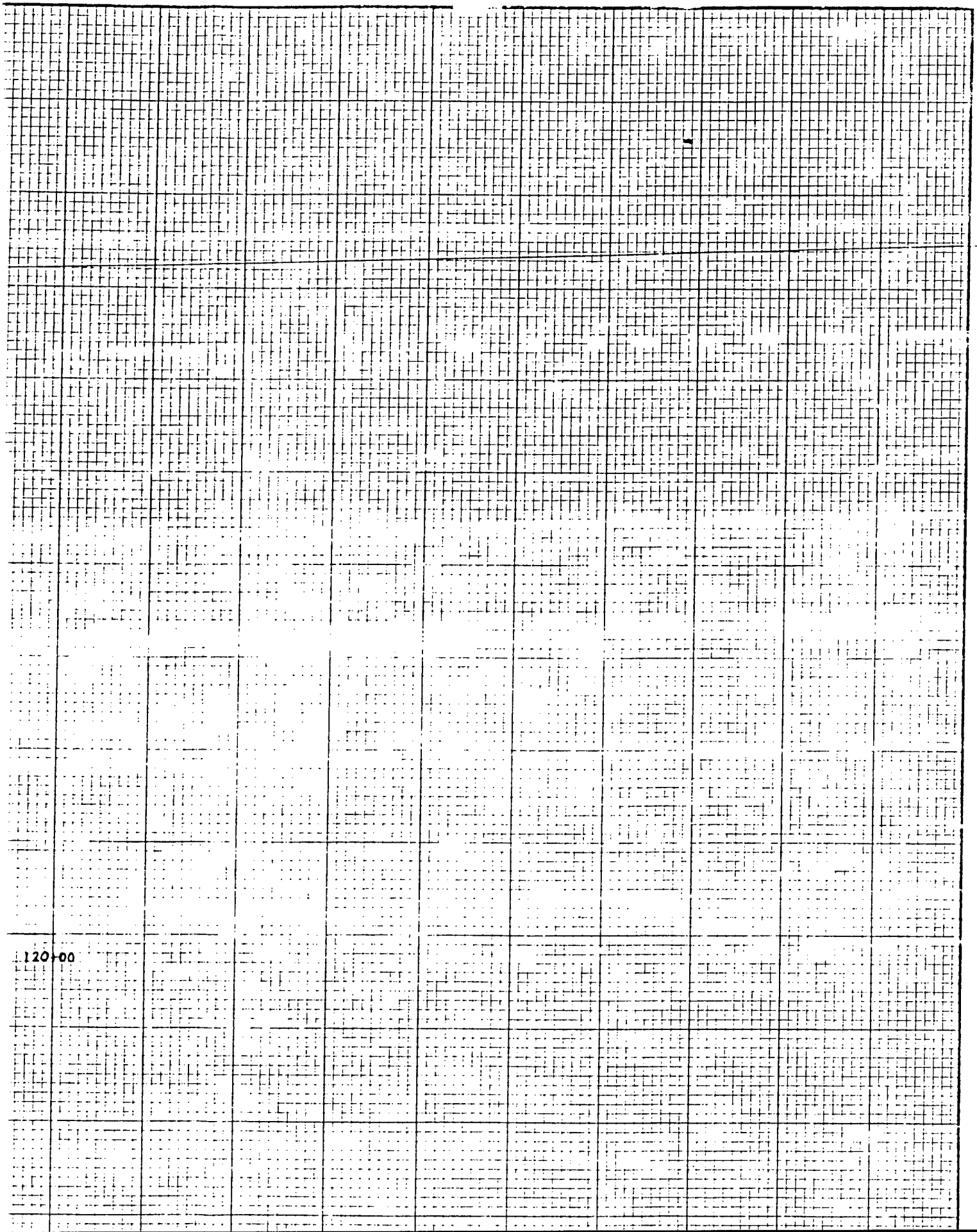
TYPICAL CRO
W.P.R.R. T


: 12" Min. Construction
ment Needed for RCB's
R/W
41.0'
12'
12'
12'
1.5'(TYP.)
12'
8'
10'
13'
1.5'(TYP.)
SECTION
KING RD. CROSSINGS
TYPIC
U/S OF BYPASS
Levees
18" Rock
10' Min
Variable Fill
KING ROAD (TRIPLE BOX)
12'Wx10'H EA.
TYPICAL CROSS-SECTION
KING ROAD TO U/S END OF BYPASS
Trees to Remain
Levees to Match Existing Grade
18" Rock Riprap W/ 6" Soil Covering
BYPASS CHANNEL
Penitencia Creek
8' Min
10' Min
Cape Horn Dr.
Variable Fill
Variable Fill
50'
CONCRETE LINED
W:36', VERT. SIDES
BYPASS; ROCK LINED BW:50' SS:5.0 to 1
PENITENCIA
00
40+00
50+00
60+00
70+00
80+00
67'
R/W
39.0'
10'
36.0'
1.5' TYP
8'
9.5'
1.5'(TYP.)
18.0 Maint. Rd.
R/W
TYPICAL CROSS-SECTION
W.P.R.R. TO KING RD.

(3)

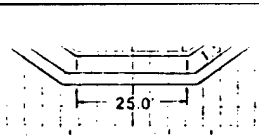

TYPICAL CROSS-SECTION
U/S OF BYPASS CHANNEL TO UPPER PEN. RD.
Levees to Match Existing Grade
18" Rock Riprap W/ 6" Soil Covering
PENITENCIA CREEK CHANNEL
10' Min
Variable Fill
Variable Fill
50'
JACKSON AVE. BRIDGE (CLEAR SPAN)
ELLC. 130.2 ELTR. 132.2
(CONSTRUCTED BY OTHERS)
HIGHWAY 680 BRIDGE (CLEAR SPAN)
(EX. BRIDGE TO REMAIN)
PENITENCIA CREEK : ROCK LINED TRAP. BW:50' SS:5.0 to 1
80+00
90+00
100+00
110+00
120+00

(4)



(5)

Note: Install 2-foot deep low flow section in all reaches of the concrete channel to conform with CDF&G requirements.



66" Pressure Water Line at 10 - 70

TYPICAL CROSS-SECTION D/S OF W.P.R.R.

TYPICAL W.P.R.R.

Upper Penitencia Creek
BW = 10 Feet

PENITE

250

240

230

220

210

200

190

180

170

160

150

PRIVATE ROAD (TO BE REMOVED)

CAPITOL AVE. BRIDGE (EX. BRIDGE TO REMAIN).

PENITENCIA CREEK: ROCK LINED TRAP.
BW:50', SS: 5.0 to 1

(6)

1.5'(TYP.)

TYPICAL CROSS-SECTION
W.P.R.R. TO KING RD.

Approx. 46 Feet

187.5'

184'

1.5:1

1.5:1

ia Creek
Feet

SECTION
PENITENCIA CREEK ROAD CROSSING

PRIVATE ROAD (TO BE REMOVED)

PENITENCIA CREEK ROAD (CLEAR SPAN) ELLC. 186', ELTR. 187.5'

PRIVATE ROAD (EX. BRIDGE TO REMAIN)

PIEDMONT AVE. (EX. BRIDGE TO REMAIN)

PRIVATE ROAD (EX. BRIDGE TO REMAIN)

PRIVATE ROAD (EX. BRIDGE TO REMAIN)

Percolation Pond

Flood Wall Ht. Varies

Maint. Rd.

Existing Ditch to Remain

Trees to Rem

Penitencia Creek

TYPICAL CROSS-
U/S OF PIEDMON
(EXCEPT NEAR PER

Levee of Variable Ht. to Equal Opp. Levee

Trees to Remain

10' Min.

Variable Ht.

Penitencia Creek Rd.

TYPICAL CROSS-SECTION
UPPER PEN. RD. TO PIEDMONT AVE.

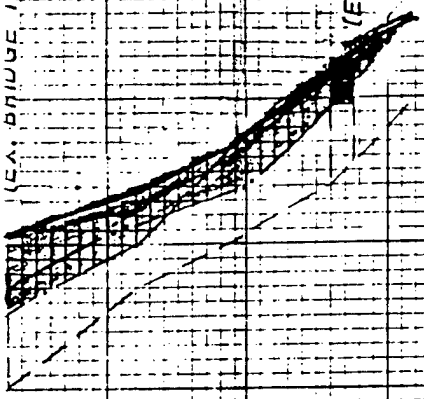
TRAP.

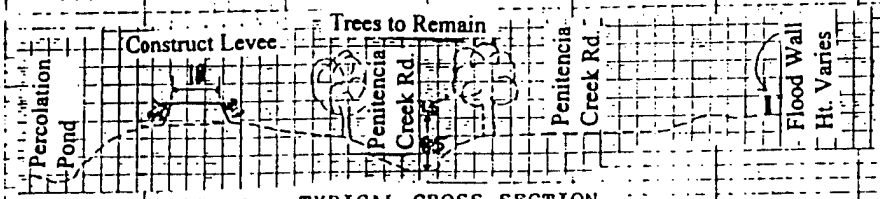
MODIFIED FLOODPLAIN UPPER PENITENCIA CR. ROAD TO U/S LI

(7)

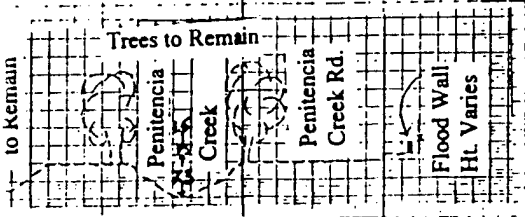
(EX. BRIDGE TO REMAIN)

NOBLE AVE. (EX. BRIDGE TO REMAIN)

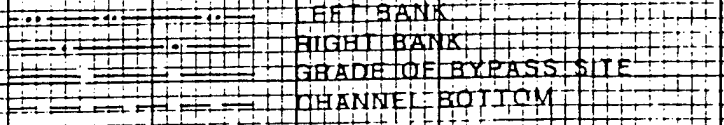




TYPICAL CROSS-SECTION
U/S OF PIEDMONT AVE.
(NEAR PERC. PONDS)



TYPICAL CROSS-SECTION
U/S OF PIEDMONT AVE.
(EXCEPT NEAR PERC. PONDS)



AD TO U/S LIMIT OF PROJECT →

(8)

NOTES: 1) CROSS-SECTIONS LOOKING UPSTREAM.

2) FLOODWALLS AND/OR LEVEES ALONG BOTH BANKS OF CREEK ARE 100' APART.

3) CROSS-SECTIONS NOT DRAWN TO SCALE.

REQUIRED FLOODWALL OR LEVEE
100-YEAR WATER SURFACE ELEVATION
BYPASS CHANNEL INVERT

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY

TRACED BY

CHECKED BY

SUBMITTED

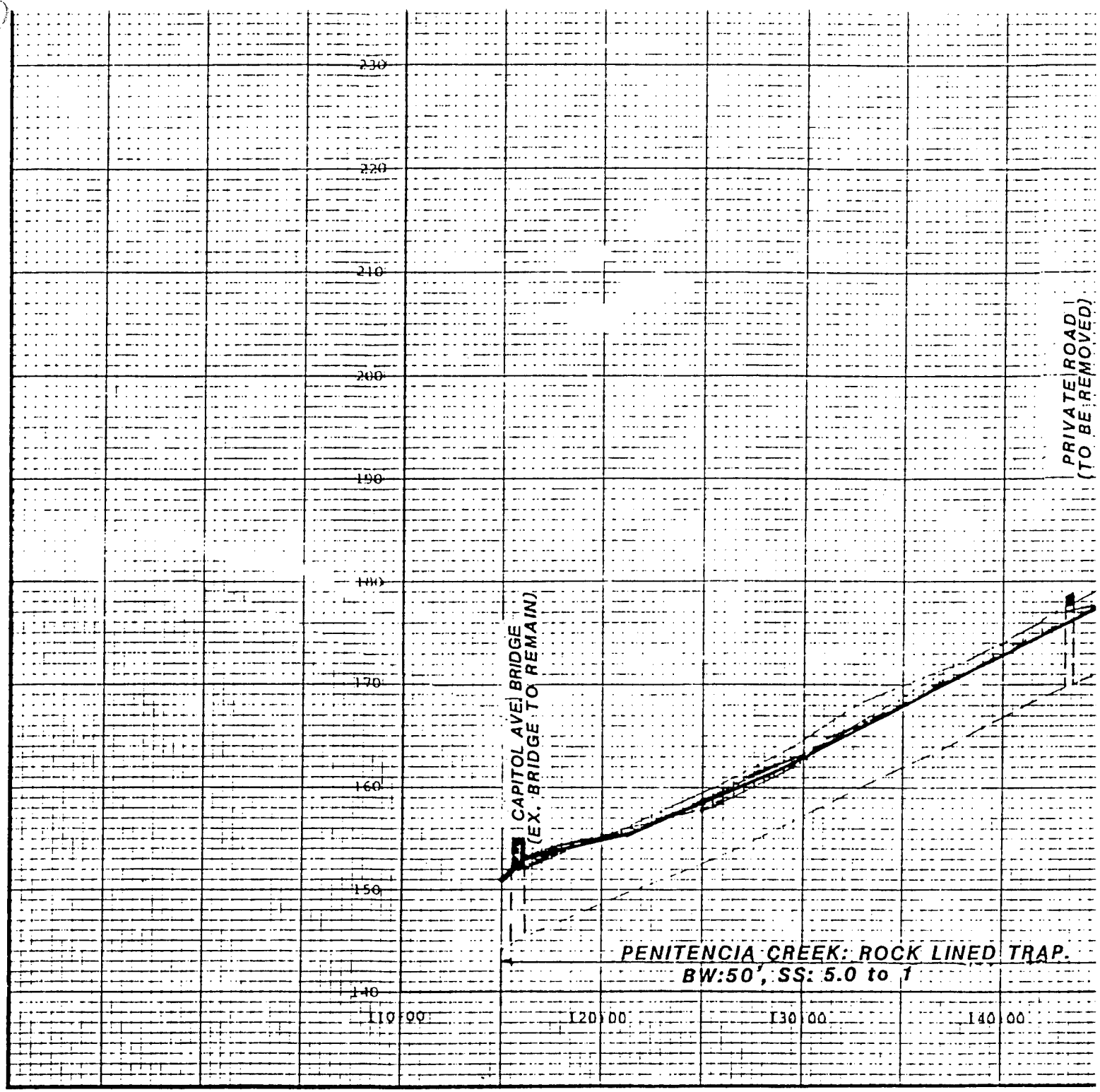
UPPER PENITENCIA CREEK
EXISTING CONDITIONS OF CHANNEL

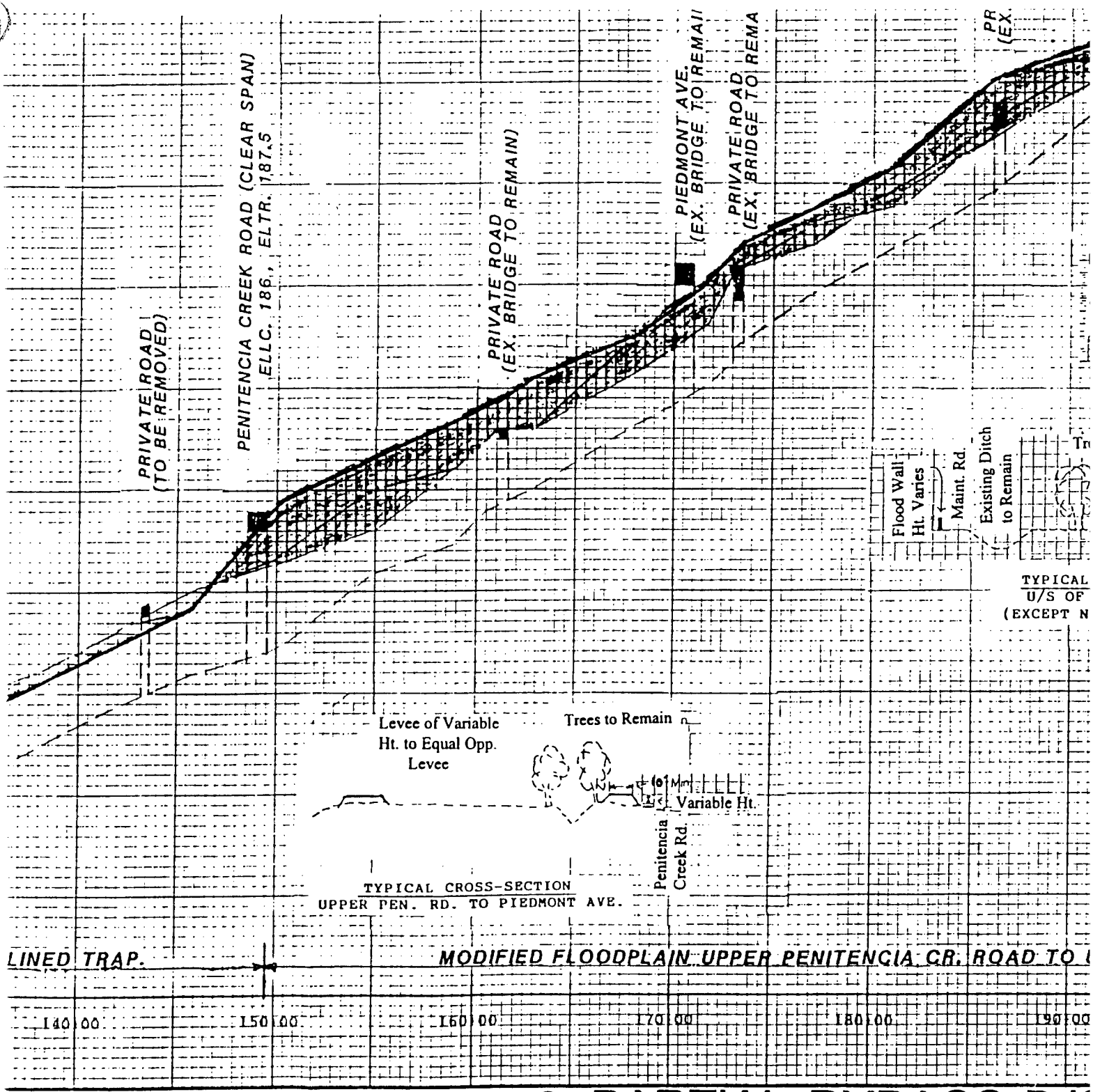
APPROVAL RECOMMENDED:

CHIEF, DESIGN BRANCH

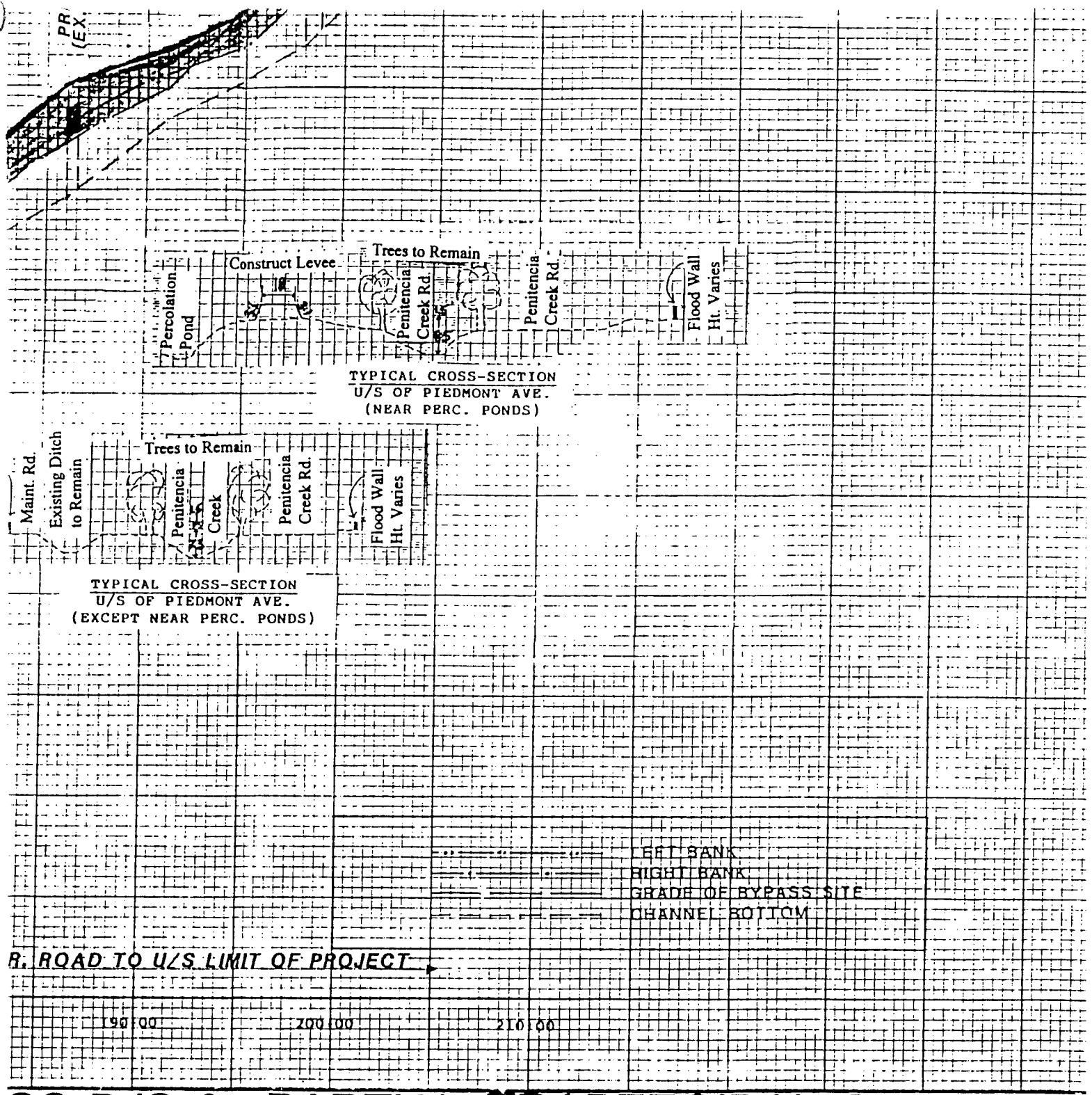
APPROVED: DATE:

CHIEF, PLANNING-ENGINEERING DIVISION


230
220
210
200
190
180
170
160
150
140
110 00
120 00
130 00
140 00
PRIVATE ROAD
(TO BE REMOVED)
CAPITOL AVE. BRIDGE
(EX. BRIDGE TO REMAIN)
PENITENCIA CREEK: ROCK LINED TRAP.
BW:50', SS: 5.0 to 1



ALT. #3: PARTIAL BYPASS D/S



SS D/S & PARTIAL TRAPEZOIDAL CHANNEL

NOTES: 1) CROSS-SECTIONS LOOKING UPSTREAM.

2) FLOODWALLS AND/OR LEVEES ALONG BOTH BANKS OF CREEK ARE 100' APART.

3) CROSS-SECTIONS NOT DRAWN TO SCALE.

REQUIRED FLOODWALL OR LEVEE
100-YEAR WATER SURFACE ELEVATION
BYPASS CHANNEL INVERT

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SAN FRANCISCO
CORPS OF ENGINEERS
SAN FRANCISCO, CALIFORNIA

DRAWN BY

TRACED BY

CHECKED BY

SUBMITTED:

UPPER PENITENCIA CREEK
EXISTING CONDITIONS OF CHANNEL

APPROVAL RECOMMENDED: _____ CHIEF DESIGN BRANCH

APPROVED: _____ DATE: _____ CHIEF PLANNING-ENGINEERING DIVISION

PREPARED UNDER THE DIRECTION OF

COLONEL, C.E., DISTRICT ENGINEER

SCALE: -

JOB NO

DRAWING NUMBER

SHEET

ANNEL WITH MODIFIED FLOODPLAIN U/S